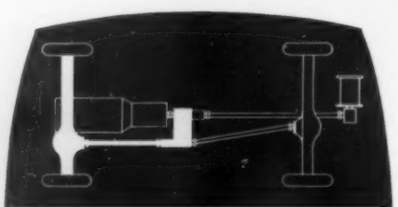
DIESEL GAS ENGINE PROGRESS

DIESEL ENGINES • DUAL FUEL ENGINES • NATURAL GAS ENGINES • GAS TURBINES

FIVE DOLLARS PER YEAR JULY, 1960 FIFTY CENTS PER COPY

When you need "pull" power as well as "push"...

THE ANSWER IS TIMKEN-DETROIT® FRONT DRIVING AXLES!



Rockwell-Standard produces front driving axles ranging in capacities from 4,800 lbs. to 20,000 lbs., for any type of medium and heavy-duty vehicle. Their record of outstanding performance on large off-highway fleets is unequalled throughout the industry.

There are many times when you need the extra power of front driving axles in rugged off-highway operations. And only the complete line of Timken-Detroit front driving axles and transfer cases best meets every requirement for these multi-wheel drive assemblies.

For more than 50 years, Rockwell-Standard has supplied components for multi-wheel drives. Rockwell's design, engineering and manufacturing experience—plus advanced research and testing facilities—assures highest quality. Use vehicles with multi-wheel drive for peak off-highway performance . . . *and specify Timken-Detroit!*

World's largest manufacturer of axles for trucks, buses and trailers.

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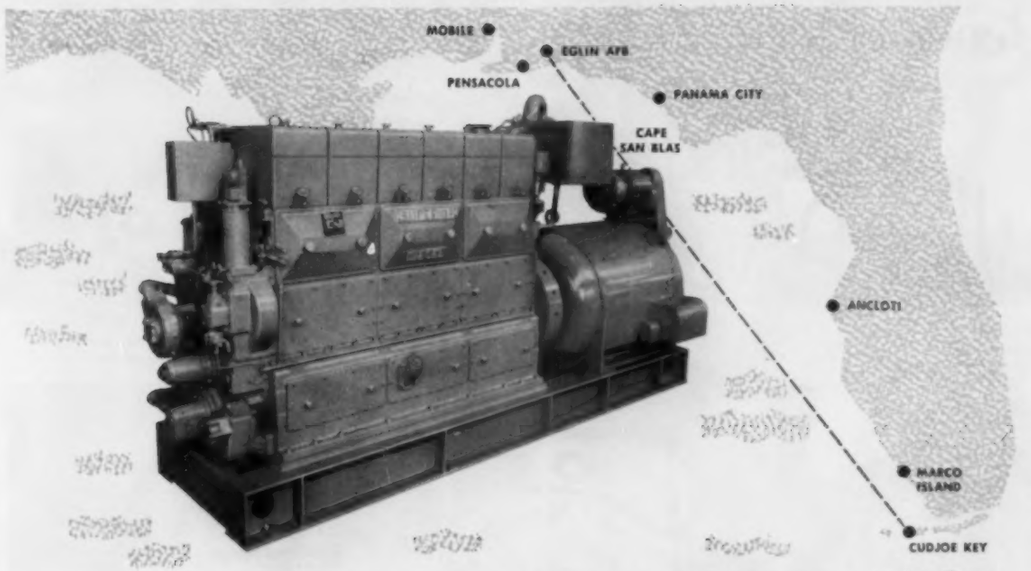
ROCKWELL-STANDARD CORPORATION

ROCKWELL R STANDARD®

Transmission and Axle Division, Detroit 32, Michigan



WHITE SUPERIOR ENGINES

help "keep score" at one of America's newest missile ranges

The Eglin Gulf Test Range (EGTR), consisting of five missile tracking stations, extends 450 miles from Eglin AFB, Florida down the west coast to Cudjoe Key, 23 miles east of Key West. At Eglin AFB and at three of the five tracking stations, power is supplied by White Superior Model 40-SX-6 engine-generator sets. Each of the five Superior engines on EGTR develops 361 BHP to produce 250 KW. At Cudjoe Key (shown below), two of the Superiors provide power for range safety equipment, trajectory measuring systems, drone control and telemetering devices, from which data is sent back to Eglin.

America's newest missile range joins an impressive list of Superior-powered U.S. defense installations, which include the "Texas Towers," portions of "DEW" line and the "SAGE" project, Atlas and other launching stations, and other missile tracking ranges. Government acceptance of White Superior engines for these installations is proof that Superior meets all requirements for rugged dependability, trouble-free maintenance and maximum fuel economy. Superior engines, from 215 to 2150 HP or 150 to 1500 KW, can likewise be custom-engineered to meet your exact requirements, including automatic, unattended or remote controlled operation. Write for complete information today!

Superior ENGINES · ATLAS Imperial DIESEL ENGINES · White DIESEL

White Diesel

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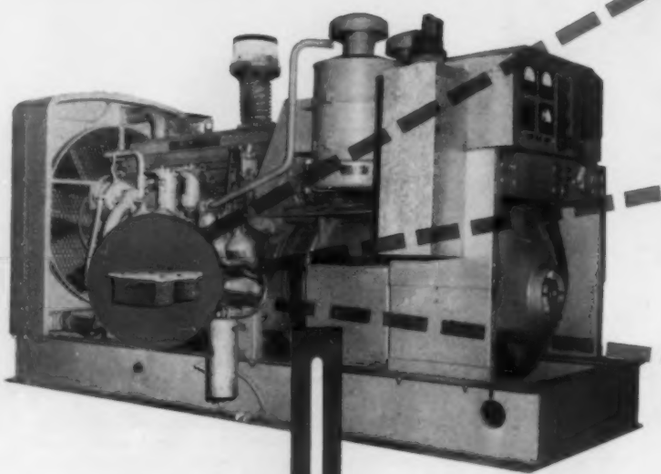
U.S. Air Force Photos

General Motors Reliability in Action...

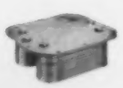
Stand-by When Power's in Peril!

HOSPITALIZATION demands minute-to-minute readiness for emergencies!



COMMUNICATION calls for the 24-hour-a-day relay of items of information!

PRESERVATION of frozen foods requires around-the-clock temperature control!



Harrison Heat Exchangers —Reliable Products of General Motors Research and Engineering.

Harrison-Cooled GM Diesels Drive Generators for Power When Main Lines Fail!

A storm hurtles in from the sea . . . power lines are down . . . transformers are blown! Emergencies must be met . . . and they are met with reliable stand-by equipment. GM Diesel-driven generators pour out the power to preserve the vitality of a community! And Harrison heat exchangers cool the engine oil on this reliable generating equipment. Harrison—with a half century of experience in the heat-control field—assures you of top-quality products that are researched and engineered to control vital temperatures with maximum efficiency. The most advanced industrial, aviation and marine equipment relies on Harrison heat exchangers. If you have a cooling problem, look to the leader . . . rely on Harrison for the answer!

GM HARRISON

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AIRCRAFT, AUTOMOTIVE, MARINE AND INDUSTRIAL HEAT EXCHANGERS

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, NEW YORK

DIESEL AND GAS ENGINE PROGRESS

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FRONT COVER ILLUSTRATION

The *Carol Foss* and *Shannon Foss*, powered by 1200 hp Nordberg engines, display speed and power in Puget Sound. See Page 22 for a story on these vessels.

MERCEDES-BENZ

MERCEDES-BENZ ENGINES ADD TO THE FUN AT FREEDOMLAND

The world's largest, newest entertainment center —Freedomland—has just opened in New York City. Among the most interesting attractions are boat rides through scenes of the American past... in craft based on authentic vessels of earlier days. To insure maximum passenger comfort on these rides, and in the interest of sustained operation—sixteen hours per day and seven days a week—reliable, smoke-free Mercedes-Benz engines power the nine "trapper canoes" and two sidewheeler tugboats.

"We've worked with Mercedes-Benz engines for years, and we have complete confidence in them." So says Phil Gauss, General Manager for Minneford Yacht Yard Inc., City Island, New York, the firm that built this version of an 1850 sidewheeler tugboat.

MERCEDES-BENZ DIESEL ENGINES—
A PRICE-QUALITY STANDARD SECOND TO NONE

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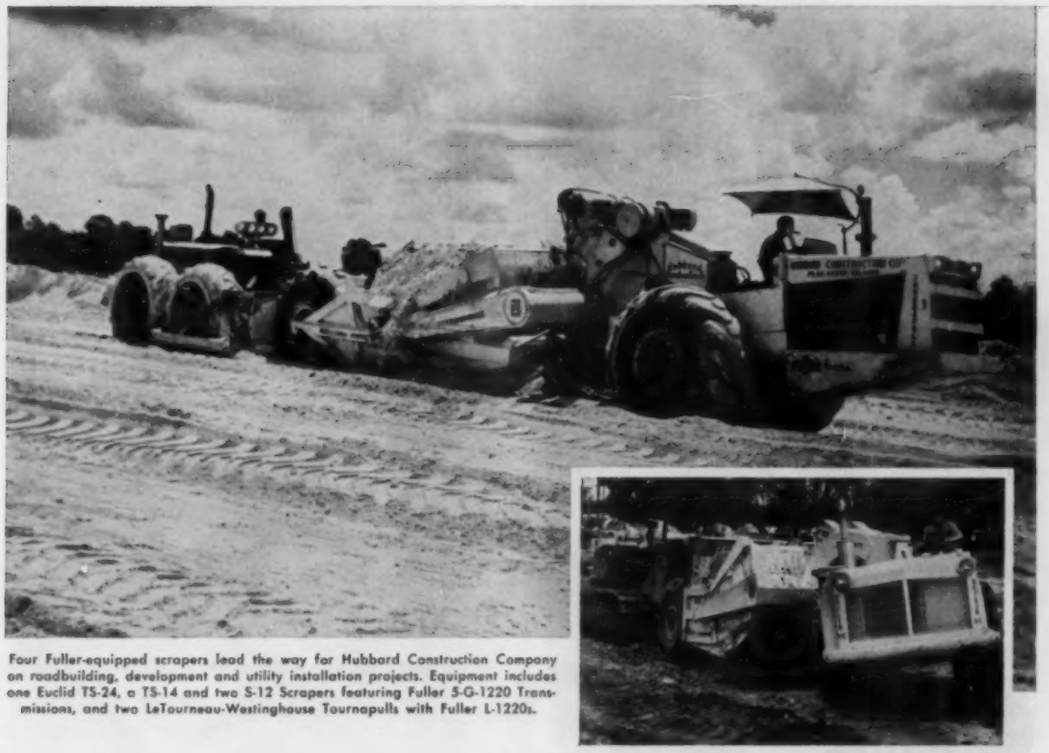

Four Fuller-equipped scrapers lead the way for Hubbard Construction Company on roadbuilding, development and utility installation projects. Equipment includes one Euclid TS-24, a TS-14 and two S-12 Scrapers featuring Fuller 5-G-1220 Transmissions, and two LeTourneau-Westinghouse Tournapulls with Fuller L-1220s.

Geared by FULLER . . .

"We get faster work cycles and longer life with countershaft brake and pressure lubrication systems."

"Reliability, economy and serviceability are exceptionally important in purchasing new construction equipment," says J. C. Reddick, Vice President, Hubbard Construction Company, Orlando, Florida. "Fuller Transmissions meet the requirements for long life and fast work cycles that we must have in our scraper operations."

Fuller's countershaft brake gives quick, easy upshifts without double clutching, keeps speeds up and cuts cycle time. The pressure lubrication and filtration system prolongs gear and bearing life.

For long life, easy shifting and positive lubrication in your scraper operations, specify Fuller Transmissions which include the countershaft inertia brake and pressure lubrication and filtration systems.

Ask your dealer about these features designed to put more profit in your operation.

FULLER — *TRANSMISSION DIVISION* — **MANUFACTURING COMPANY**
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for the Best Diesel Engines— Buy GENERAL MOTORS

A precision-built liner for a General Motors Diesel engine

Tie up to GM Service.

FOR fifty years, General Motors Diesel engines have had an excellent reputation for dependability. This enviable reputation has been established because a good product has been backed by good service. Replacement parts are precision-built and include the latest engineering improvements to make GM engines the finest in the field.

Whether it be new engines, replacement parts or regular maintenance service, you are right when you buy General Motors Diesel engines.

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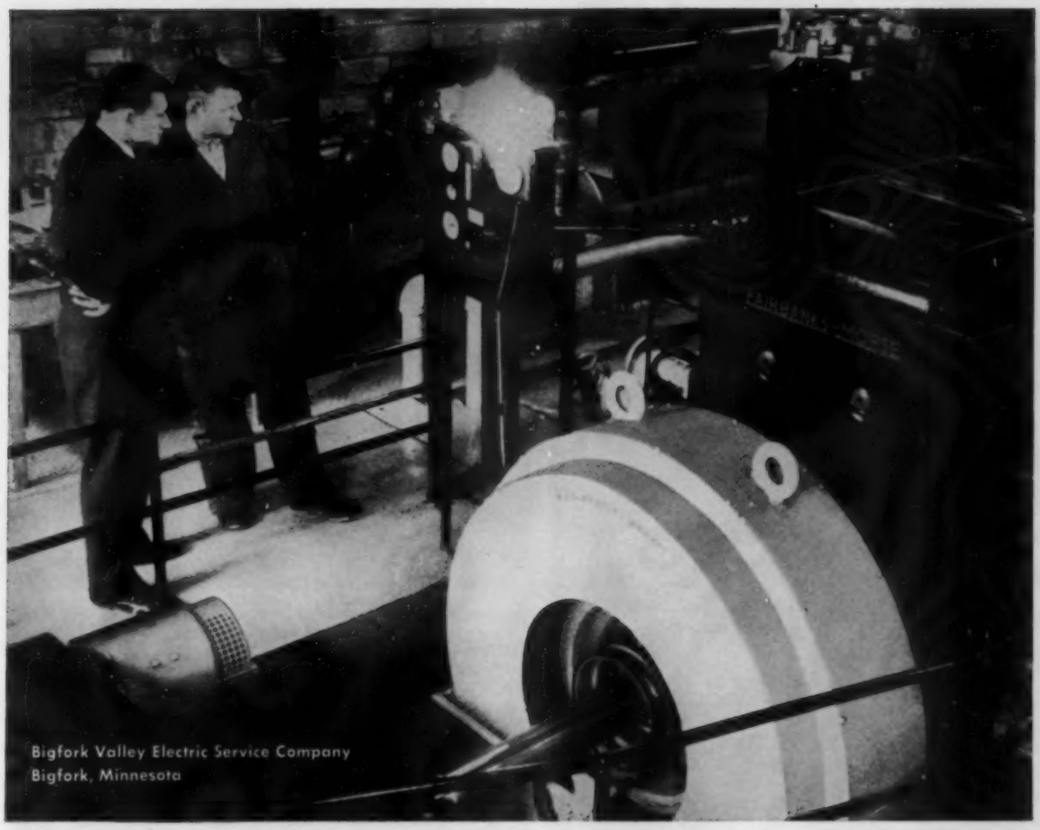


Bigfork Valley Electric Service Company
Bigfork, Minnesota

1/2 HOUR DOWN-TIME IN 6 YEARS WITH CITIES SERVICE LUBE OIL

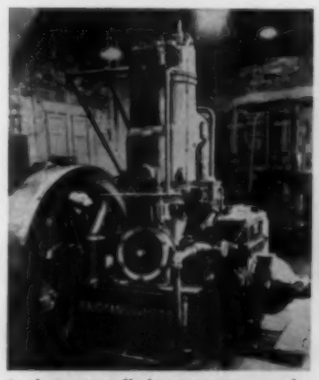
This 300 KW generator supplies a major portion of the Bigfork power supply. Nearby is one of Minnesota's largest lumber mills which, during the cutting season, saws three to four million board feet of white pine. During this season the power plant operates at peak load and can ill afford down-time on a major piece of equipment.

For this reason, Bigfork relies on Cities Service DC-500 Lube Oil. Orbin Holt, of Bigfork Valley Electric Service Company states, "Cities Service has given us excellent technical advice on our lubrication practices, and we couldn't ask for better results than we have received with DC-500 oil. We have had only ½ hour down-time on this generator in six years and that wasn't a lubrication failure."

Cities Service DC-500 with its high level of detergency-dispersion and great anti-oxidation and anti-corrosion properties is typical of the complete line of diesel lubricants available for every type of service and all types of equipment. Expert technical assistance is at your call with experienced Cities Service Lubrication Engineers. Call the nearest office or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Ancient one-cylinder generator was installed in 1929 and is still called on for its 35 KW output during peak loads. Careful maintenance and quality lubricants are credited for its long life.

Sludge in engine ends with switch to STANODIESEL Oil M

The team that got the engine back in shape; (l. to r.) Vernon Schwertel, Ronald Darbo and Standard's Fred Parkinson. Providing lubrication technical service on problems like this one is not new to Fred Parkinson. He's been doing it for 11 years. He has further qualification for such work—an engineering degree from Brown University. Fred has also completed the Standard Oil Sales Engineering School.

Situation: For five years a 1,400 hp. engine in the Municipal Light Plant, Arcadia, Wisconsin, was operated on STANODIESEL Oil M. During this time the engine ran free and clean. It carried a major share of the plant's 20,000 kw. output. A decision was made to switch the engine to another lubricant since it was believed one oil was as good as another.

What happened: Within two years the engine had sludged up so much, the oil had to be removed and replaced by STANODIESEL Oil M. Three months later the engine had cleaned up and was again carrying its share of the plant's load.

Clean engine operation is possible with STANODIESEL Oil M because of its superior base stock and its combination of additives that are available in no other oil. Superior base stock and exclusive additives give you these cost-saving operating and maintenance advantages: less sludging, low oil consumption, reduced port deposits, fewer stuck rings, less need for ring replacements, less cylinder wear, lower filtration costs, fewer bearing problems.

Get more facts about STANODIESEL Oil M. Call the Standard Oil office near you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

Quick facts about STANODIESEL Oil M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by economy fuels.
- Maintains film on difficult-to-lubricate parts.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil mix.

WESTERN GEAR HIGH SPEED PIPELINE DRIVES CHOSEN FOR TRANSWESTERN-COLUMBIA-GULF FOR...

EFFICIENCY — Western Gear high precision manufacture guarantees low power losses through the gear drive . . . a vitally important factor in the high proven efficiency of engine driven pipeline centrifugal compressors. Certified factory full-load, full-speed tests show a maximum of 2.0% loss through the 5,000 horsepower 2-stage drives pictured. Truly exceptional, considering the unit size and relatively high speeds encountered . . . over 6,000 r.p.m. and 15,000 f.p.m. pitch line velocity.

DEPENDABILITY — Western Gear's unsurpassed application experience with 2-stage pipeline drives combined with years of close cooperation between Gulf-Interstate, Cooper-Bessemer and Western Gear engineers, assures dependability . . . a Transwestern must. Rigid Western Gear quality control procedures include Magnafluxing, ultrasonic and X-ray inspection of vital parts, which afford maximum protection against sub-surface defects not discoverable by ordinary methods.

For full information on Western Gear pipeline drives, write, wire or phone: **INDUSTRIAL PRODUCTS DIVISION**
P.O. BOX 126 • BELMONT, CALIFORNIA • PHONE: LYtel 3-7611

WG

INDUSTRIAL PRODUCTS DIVISION

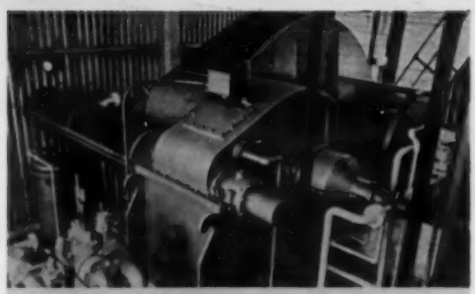


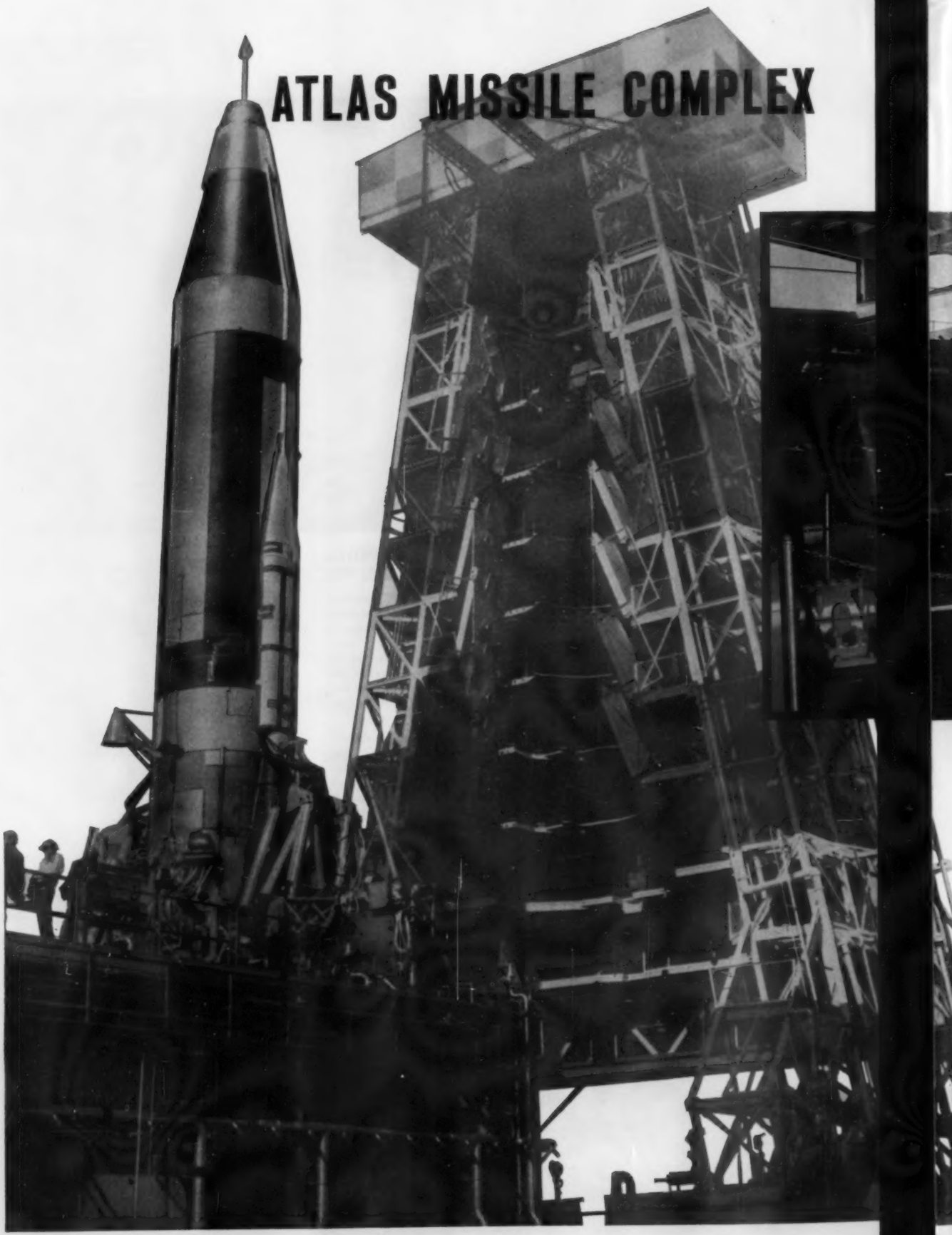
Photo above shows one of twenty units installed over three years ago on Columbia-Gulf Pipeline (formerly Gulf-Interstate Pipeline). Units are of the 2-stage type similar to the ten units currently being supplied for Transwestern. Cooper-Bessemer natural gas engines capable of delivering 5,000 horsepower at 360 r.p.m. drive through Western Gear Corporation Model 4525THS20-16 pipeline drives to Cooper-Bessemer centrifugal compressors at 6,050 r.p.m.

WG-6003

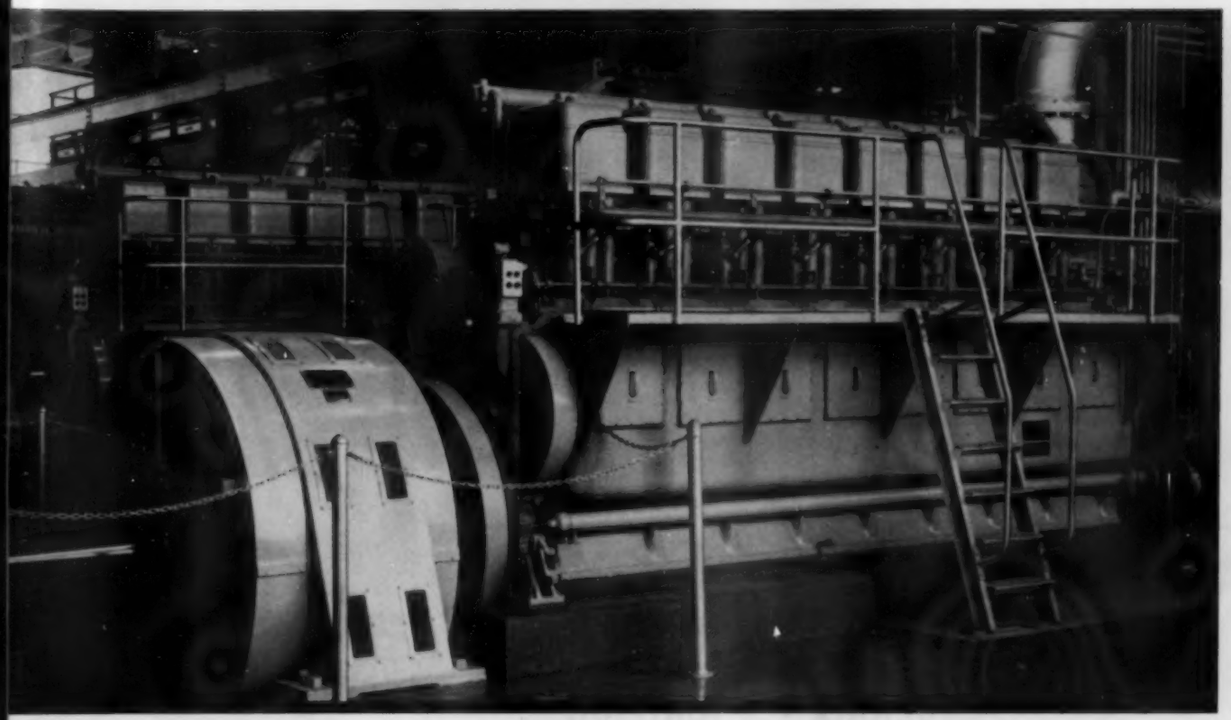
OTHER WESTERN GEAR POWER TRANSMISSION PRODUCTS

integral gearmotor — *parallel shaft reducer* — *vertical shaft reducer* — *high speed unit* — *right angle reducer*

ATLAS MISSILE COMPLEX



...UNFAILING POWER SUPPLY assured with 6 NORDBERG DIESELS



The locale . . . an isolated point of land jutting into the Pacific Ocean near Los Angeles. Sprinkled through this brush-covered area is the incongruous evidence of the free world's first operating and training base for both intercontinental (ICBM) and intermediate range (IRBM) ballistic missiles. Suddenly, the area has sprouted towering gantries, huge concrete slabs, a busy air field, shops and offices, homes and barracks. This is Vandenberg Air Force Base, which has mushroomed into a populated, multi-billion-dollar aero-space age defense establishment.

The major mission of Vandenberg is to maintain an operational status with ICBM's. The base must be ready at a moment's notice to blast off its "birds" without fail. Vandenberg also serves as a training site for SAC ICBM crews to be deployed at bases throughout the country.

To insure an unfailing power supply, the Atlas Complex includes a modern power plant, comprised of six husky Nordberg turbocharged diesels rated 1344 hp at a conservative 450 rpm, giving the plant a total capacity of 8,064 hp. Each engine drives a 956 kw generator, and the total capacity of over 5700 kw gives the plant plenty of reserve capacity . . . a Nordberg diesel-electric generating plant that assures the world that no electric power failure will delay the gigantic Atlas guided missiles if they must soar into space in any emergency.

NORDBERG MANUFACTURING COMPANY
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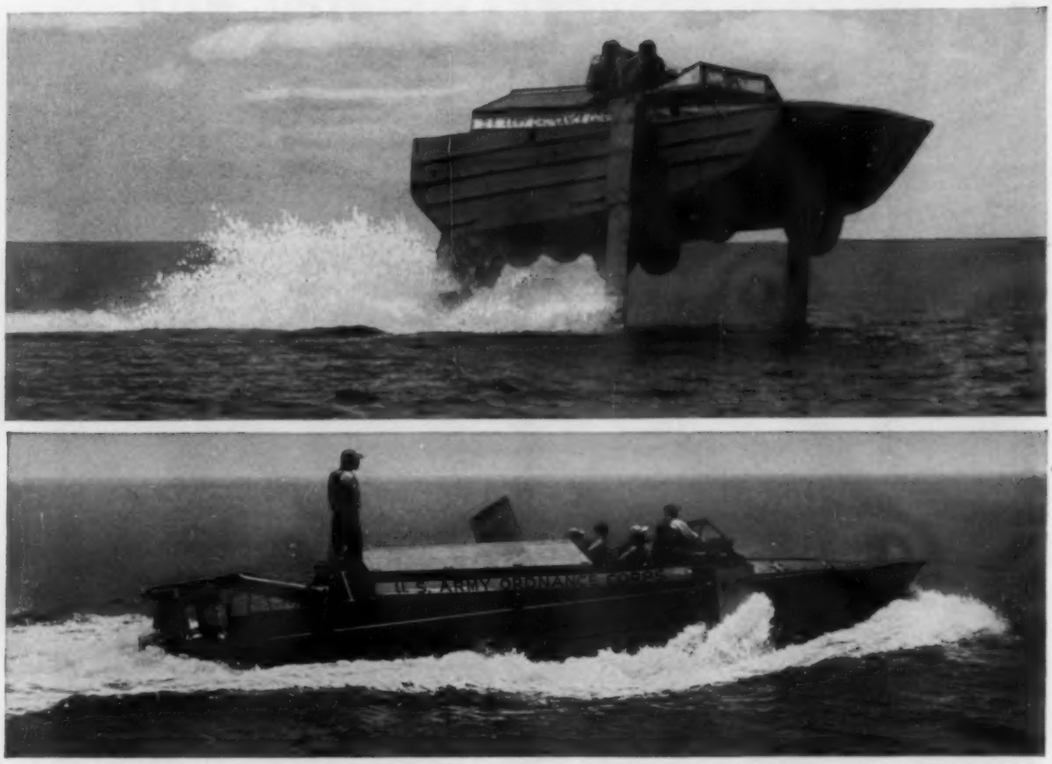
P980



Shown in full "flight" above the water (top picture) and cruising (lower picture) is the Army's "Flying Duck." Hydrofoil craft have potential application on short passenger and freight runs—also offer military possibilities in anti-submarine patrol, air-sea rescue, and as a mobile missile launching platform.

BENDIX JET IGNITION "FIRES" UNIQUE LAND-SEA VEHICLE

A new and interesting vehicle using Bendix® jet ignition equipment is the "Flying Duck," developed by the Lycoming Division of the AVCO Corporation for the Army Ordnance Department. This unique gas-turbine-driven hydrofoil craft travels over land like a truck, cruises on the water like a boat, and "flies" above the water on its hydrofoil wings, which are extended below the surface.

Scintilla Division is a leading developer and supplier of ignition systems for the aviation, marine and general industrial fields. Bendix ignition systems are practically standard for piston aircraft engines, and our starting ignition systems are used on the latest jet and turbo-prop types.

In fuel injection, too, Bendix is a leading name—supplying standard and special systems for diesel engines in boats, trucks, trains and power plants. Both Bendix fuel injection and gas-turbine ignition systems were chosen for the auxiliary diesel engine and the gas-turbine power plant for the world's most powerful locomotive, built by General Electric for Union Pacific.

If you have applications for ignition or diesel fuel injection systems, we can help you cut costs and increase efficiency. Whether your needs are for new design, or for proved, day-in-and-day-out performance, Bendix experience can provide the answers. For information, write Scintilla Division, The Bendix Corporation, Sidney, New York.

Scintilla Division
Sidney, New York

THE Bendix CORPORATION

Export Sales & Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

H. P. Lockhart, Assistant General Manager, Sales, Austin-Western, Construction Equipment Division, Baldwin-Lima-Hamilton, Aurora, Ill.

"On-the-job reports prove that IH power is an excellent choice for our hydraulic crane."

Customer's job records show

INTERNATIONAL® Power ideal for AUSTIN-WESTERN Crane

International UD-282 diesel shown here is interchangeable dimensionally with UB-264 gasoline engine.

For their heavy-duty hydraulic crane Austin-Western engineers specified a rugged industrial-type engine, in the 80-90 horsepower class, that would provide dependable power for the boom hoist, yet would operate smoothly and economically at road travel speeds. International UD-282 and UB-264 engines exactly met these requirements and were dimensionally interchangeable. And they gave the customer a choice of either gasoline or diesel fuel. Reports from users show that Austin-Western cranes equipped with International engines are doing outstanding jobs.

When designing your products it will pay you to check International's line-up of diesel and carbureted engines. You will find the rugged carbureted models and instant-start diesels are interchangeable in power and dimensions. And IH power flexibility provides efficient operation through wide variations in load and speed.

Investigate the many advantages available to you by powering your products with International. You have a choice of 35 engines from 16.8 to 385 max. hp, a size to fit any power requirement. For detailed information call or write International Harvester Co., Engine Sales Dept., Construction Equipment Division, Melrose Park, Ill.

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IH ENGINES

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180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE

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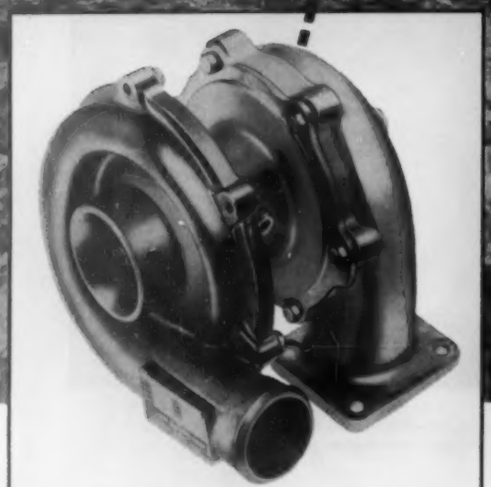

AiResearch T-6 turbocharger

International Harvester's TD-9 shows 18 percent more torque rise

AiResearch's small T-6 turbocharger now enables the 282 cu. in. engine on International Harvester's new TD-9 crawler to develop a torque equal to a naturally aspirated engine 25 percent larger in displacement. This low cost turbocharger substantially reduces the unit cost of small tractors operating at this power level.

Boosting this small block engine to 71 horsepower and greatly increasing its versatility, the above pictured T-6 model also provides up to 10 percent better fuel economy.

Weighing 24 lbs. and measuring 7¾ in. in diameter, the T-6 is one in a complete line of AiResearch turbochargers which makes the turbocharging of small diesel engines economically desirable.

AiResearch is a world leader in the development and production of air-cooled turbochargers and turbocharger controls for all major diesel engine applications. Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

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If you design, purchase, sell, operate or service diesel, dual fuel, natural gas engines or gas turbines — **Here is important information for you!**

New complete information on engines & accessories!

LOOK AT THE CONTENTS!

1. ENGINES — All major manufacturers of diesel, dual fuel, natural gas engines and gas turbines are represented in multiple page sections. Text is supplemented with specifications, power curves, photographs and sectional views.

2. TURBOCHARGERS and SUPERCHARGERS — This section of manufacturers is detailed and fully illustrated to give complete information on this increasingly important phase of the industry.

3. TRANSMISSIONS — The latest information on torque converters, fluid drives, and other modern means of transmitting power are fully described and illustrated in this section

4. ACCESSORY EQUIPMENT — Recent developments in fuel injection systems, governors, and other key accessory units are detailed and illustrated fully in this section.

5. ADVERTISING — Leading manufacturers of engines, accessories, and services bring out the important features of their products in attractive, easy to read advertisements to further enhance the reference value of the CATALOG.

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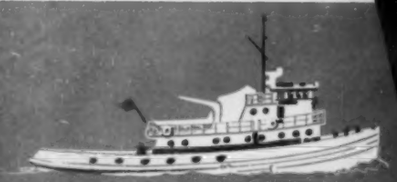

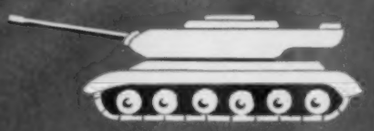

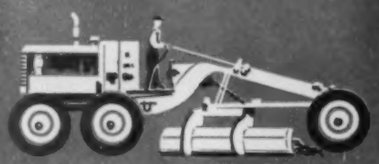

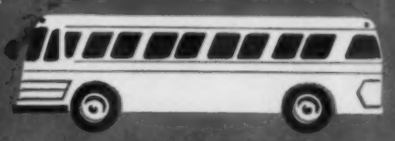

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AUTOMATION AND HIGH FUEL ECONOMY PAY OFF FOR COLUMBIA GULF

By DONALD M. TAYLOR

CONSIDER the problem of an engineer saddled with the task of improving the efficiency of natural gas pipeline operations. Basically, there are three routes he can follow: (1) He can install automation at the compressor stations and metering installations to minimize labor requirements. (2) He can improve the fuel economy of the compressor stations to reduce the sizeable fuel bill required in moving gas to market. (3) He can up the throughput of the system while maintaining operational expenses at present levels by slicking the insides of the pipe with certain coatings to reduce its resistance to gas flow.

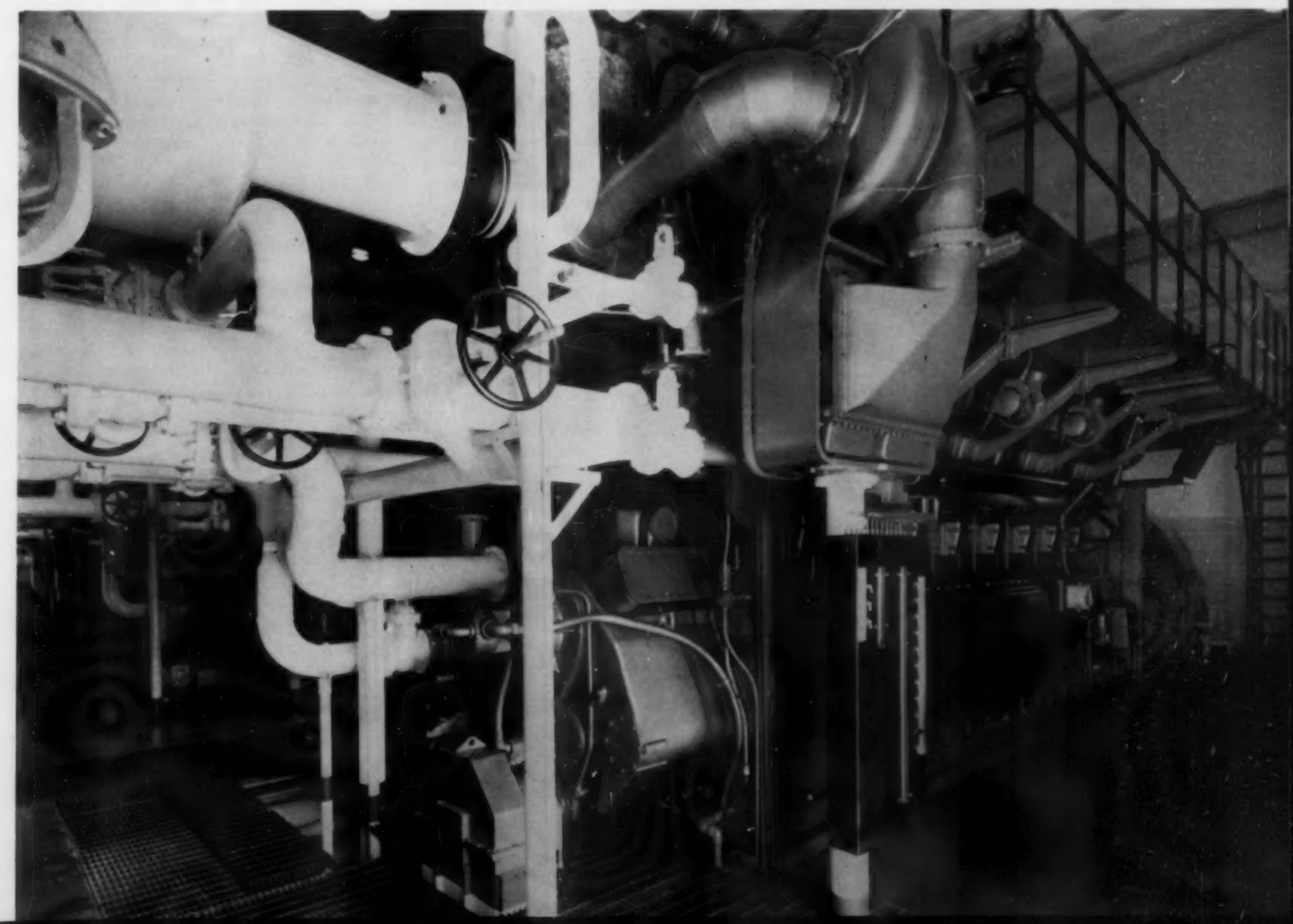
Columbia Gulf Transmission Co. elected to follow the first two courses; and late this summer when the company finishes converting its five original compressor stations to fully unattended remote operations, Columbia Gulf will have the world's first completely automated major gas pipeline. The entire system—which is 1700 miles long and has 11 compressor stations with a total of 140,550 horsepower—will be controlled by one man from the company's Nashville, Tenn. offices.

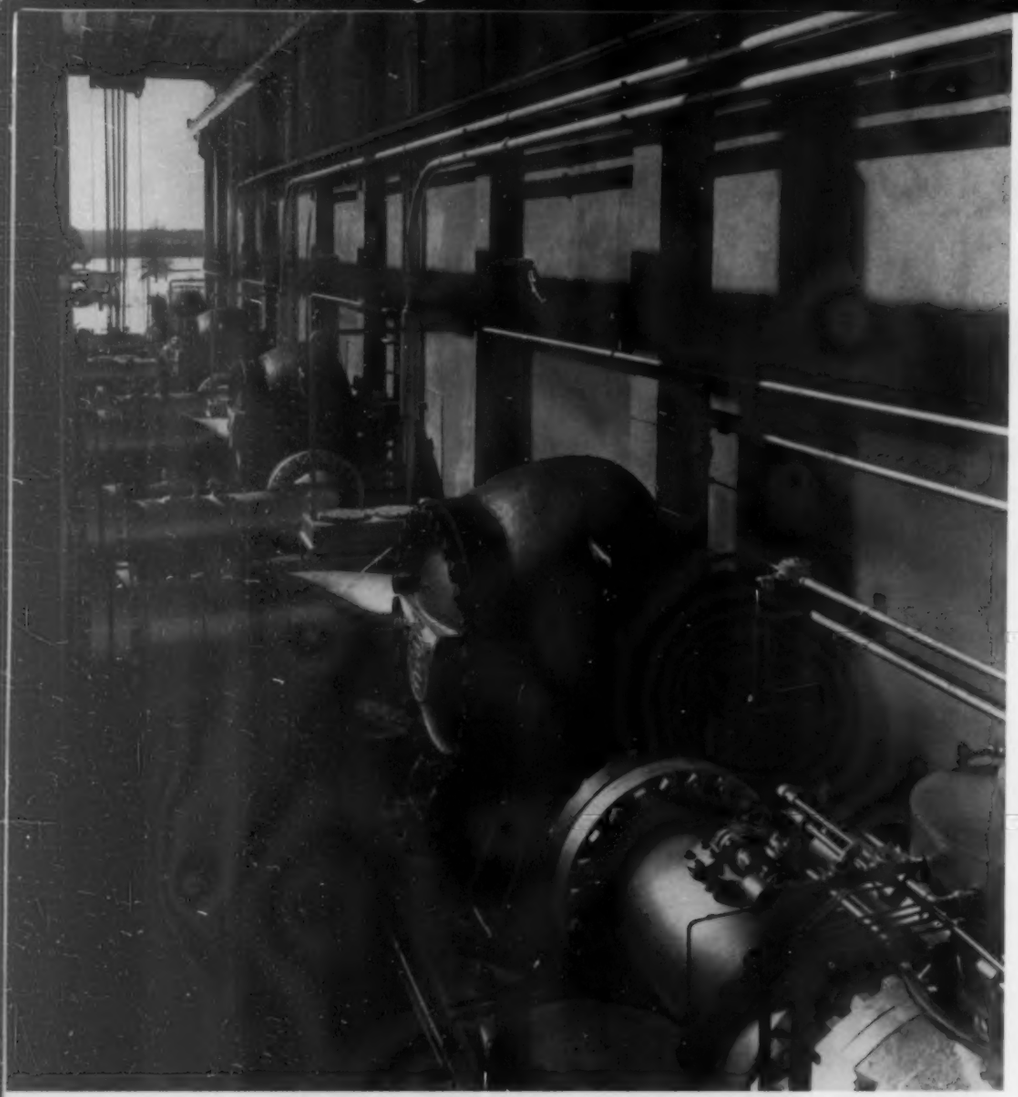
As for fuel economy, it is likely that Columbia Gulf uses less fuel per horsepower than any other company. Last year, three of the company's 10 stations averaged 7690 Btu's per horsepower hour; two stations averaged 7173 Btu's; and five of the stations averaged 6188 Btu's per horsepower hour. The latter five stations were among the most efficient performers in the entire industry in 1959. Each of these stations have four Cooper-Bessemer LSV-16-SG's driving centrifugal compressors. At one of the stations—Alexandria, La.—the four units, with a rating range of 3500 to 5000 hp each, averaged only 6101 Btu's per horsepower hour for the entire year!

The company has a new station that commenced operations in Spring and is not included above.

Background. Columbia Gulf—formerly Gulf Interstate Gas Co.—designed its system with "push-button" operation in mind. Placed in service in 1954, the system originally consisted of five

Interior view of Columbia Gulf Transmission Company's compressor station at Alexandria, La. showing three-quarter view of LSV-16-SG engines. Note forward drive housing on engine which is used to drive all lube oil and water pumps. The small gear drive shown extending through the floor grating is used to drive the main engine cooling water radiator fan. Turbocooler unit is shown in the upper center of the photograph. Note Young intercoolers. Engine is equipped with pulse generator ignition and two of four pulse generators can be seen on the engine block just below the engine walkway. At rear of engine can be seen case for Western Gear two-step speed increaser drive used for driving the RFB-24 centrifugal compressor.





Exterior view at Corinth, Miss., station showing four Cooper-Bessemer type RFB-24 centrifugal compressors. Units are driven by LSV-16-SG engines inside of building. Mounting compressors outside of station keeps high-pressure gas outside building, increases safety factor.

semi-automatic reciprocating stations spaced 180 mi. apart along the 30-in. mainline that runs from South Louisiana to Means and Leach, Ky. These stations are comprised of Cooper-Bessemer GMWA-8 engines driving reciprocating compressors at Rayne, La., Banner, Miss. and Clementsville, Ky.; and Clark TLA-6 prime movers driving reciprocating compressors at Delhi, La. and Hampshire, Tenn.

The stations are noteworthy because designers had achieved a sizeable reduction in operating and labor requirements. The stations were instrumentized for semi-automatic operation, and each engine was equipped with mechanical drives for its own auxiliaries. This eliminated the conventional auxiliary power building and at the same time reduced power requirements and labor costs. And thanks to the new engines with gear-driven turbochargers, fuel economy back in 1954 was considerably better than industry averages.

The first step in the direction of complete automation came in 1955 when Columbia Gulf designed and constructed an experimental unattended "satellite" station at Stanton, Ky. controlled from 80 mi. away at Clementsville. The station could be started, stopped and fully operated remotely. In addition, it was the first pipeline installation of the Cooper-Bessemer, 4 cycle, Vee-type, 16 cylinder LSV-16-SG engine driving centrifugal compressors.

Following successful operations at Stanton, the company designed four additional automatic, unattended mainline stations, which were operating by the end of 1957. These stations were constructed at Alexandria, La., Inverness and Corinth, Miss. and Hartsville, Tenn. with four LSV-16-SG engines installed in each location. At the same time, the Stanton station was increased to the same size with installation of three additional engines. These stations were spaced alternately between the original stations and gave the company a total horsepower range of 70,000 to 100,000 hp in unattended stations—depending on the horsepower output taken from the engine—all powered by LSV-16-SG's.

For the past three years, the over-all system, including operations of these automatic stations and automatic control of two transport measuring stations, has been remotely controlled from Nashville. When the original stations are switched into full automation this summer, a single centralized transport control console, requiring only one man, will operate the entire system.

Engines. All five of the unattended centrifugal stations have four LSV-16-SG's similar to the prototype unit installed at Stanton. One of the innovations offered by this engine is "turbocool-

Recent compressor engine cost and fuel study made by Columbia Gulf Transmission Co. on the Cooper Bessemer LSV-16-SG engines.

Engine Compressor Location	Installed Horsepower: Total Hours Available	Installed Horsepower: Total Hours Utilized	Installed Horsepower: Utilization Per Cent	Compression: Total MCF Compressed	Compression: Avg. Suct. Press. Psig	Compression: Avg. disch Press. Psig	Compression: Avg. Ratio	Load on Utilized Engines: Average Per Cent	Load on Utilized Engines: Total Developed Horsepower Hours	Fuel Consumption: Total MCF @15.025#/lb	Fuel Consumption: Cu.Ft.Per MCF Compressed	Fuel Consumption: *Measured Cu.Ft./ Developed HP Hour	Fuel Consumption: **Standard Cu.Ft./ Developed HP Hour
Cooper-Bessemer LSV-16SG (Centrifugal)													
Alexandria	122 640 000	96 390 000	78.60	227 740 874	677	925	1.358	110.17	106 197 112	662 665	2.910	6.240	6.101
Inverness	122 640 000	78 218 500	63.78	227 205 931	723	930	1.286	110.38	86 337 874	567 695	2.499	6.575	6.428
Corinth	122 640 000	96 760 687	78.90	225 828 512	682	930	1.364	110.85	107 254 835	672 071	2.976	6.266	6.126
Hartsville	122 640 000	79 474 500	64.80	224 212 795	706	926	1.333	111.60	88 694 122	557 019	2.484	6.280	6.140
Stanton	122 640 000	81 788 500	66.69	222 448 117	708	929	1.306	111.72	91 371 771	577 535	2.596	6.321	6.180
Totals & Averages	613 200 000	432 632 187	70.55	1 127 436 229				110.92	479 855 714	3 036 985	2.694	6.329	6.188

*Cubic Feet as Measured at 15.025#, 60°F, uncorrected for normal water vapor obtaining in our gas stream.

**Standard Cubic Feet is the measured Cubic Feet of 15.025#, 60°F, completely saturated with water vapor, reduced to the volume equivalent of 1000 BTU/Cu.Ft., lower heating value. (Lower heating value developed from measured BTU/Cu.Ft. of 1044 for all stations. Measured BTU being at 14.735#, 60° saturated.)

NOTE: All stations 14,000 installed horsepower.

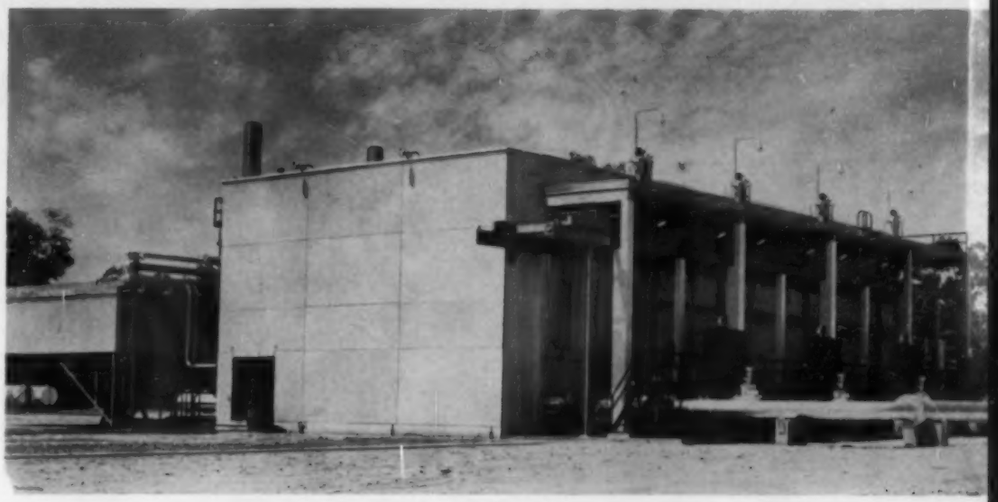
ing." This is a combination of exhaust-driven turbocharging and combustion air cooling. The latter is effected by means of a heat exchanger and an expansion turbine. This system has been described in previous issues of DIESEL AND GAS ENGINE PROGRESS with other types of applications for the engine, but will be described again briefly for information of the pipeline industry.

Here's the way it works. Intake air is first compressed by an exhaust-driven turbocharger. Next, the air is compressed by a second centrifugal compressor, cooled in a pass through the heat exchanger and expanded across the blades of a turbine driving the self-same second compressor. Expanding the air across a turbine removes more heat than would be removed through normal expansion. The net effect of this turbocooling is a "boot strap" operation to provide additional cooling of intake air at the expense of a slight over-all decrease in pressure from the exhaust-driven turbocharger. This additional cooling enables the four-cycle engine to pack more pounds of combustion air into the power cylinders, adding to horsepower and efficiency.

All five of the automatic stations are almost identical. Inside each building are four engines, each coupled to individual 16.82 to 1 Western Gear speed increasers. The drive shafts from the increasers extend through the building fire wall (made of 12-inch reinforced concrete) to the centrifugal compressors on the outside. Why are the compressors on the outside of the building? Primarily, it's a matter of safety. By keeping the high-pressure gas out of the building, Columbia Gulf greatly decreased the chances of explosion from gas accumulation. The only gas entering the building is fuel gas, and heavy steel piping makes its leakage unlikely.

Fuel Economy. It's a common saying in the gas industry that, "gas companies are their own best customers." More often than not, this statement is true. Throughout the gas transmission industry fuel gas consumption at compressor stations averages about 10,000 Btu's or 10 cu. ft. per horsepower hour, and it is not uncommon for a system to consume 10 percent of the gas it transports. Using 10 cu. ft. as an industry average, Columbia Gulf saves about 7.7-million cubic feet of gas per day. This saving has a dollar value of about $560,000 per year—more-or-less depending on the value the company sets on the gas in its line. (This cost includes the purchase price of the gas, the cost of conditioning, regulation and transportation down the line.) Because the five stations equipped with LSV-16-SG's consume only an average of 6.2 cu. ft. per hp hour, they are responsible for 6.4-million of the 7.7 million cubic feet of gas saved daily.

Pushbutton Features. Presently Columbia Gulf operates these five automatic stations remotely from headquarters at Nashville. The dispatcher can start and stop engines at each station, control discharge pressures and monitor operating conditions. Also, he can control gas at sales points and monitor pressures at four points on the system and water content at four locations along the gathering system in Southern Louisiana.



Columbia Gulf's Alexandria, La., station, exterior view. Station is typical of the five engine driven centrifugal stations in this system. Each of the four engines is rated 3500 to 5000 hp. This precast concrete building has no windows, filtered air is supplied by ventilating fans. A 24 in. x 30 in. discharge header is in foreground, seal oil emergency tanks are on the roof. Black cabinets contain measuring connections for manual control. Engine cooling water radiators are shown at the rear of the building.

The company's automatic control system, jointly designed with Union Switch & Signal Div. of Westinghouse Air Brake Co., utilizes a code method linked to stations by leased wire line. The system transfers information by applying a series of pulses on the circuit. Each control function has a different code signal and the system is designed so that incomplete or false pulses cannot register or be received. For example, an engine will not obey a stop or start order from the telemeter circuit unless conditions for the action are correct. The automatic control of a station is not dependent on the telemetering circuit, and should circuit failure occur, the station will be taken over by local automatic controls. It will continue to follow the last orders received from the centralized control center. For the most part troubles which call for shutdowns are handled locally.

Several key advantages are attributed to complete automatic controls on a pipeline system. By automatically handling all operating information on the line, versatility of the system is increased whereby high performance levels can be achieved. Improvements in judgment of sensing instruments brings about safer operations and any problems on the pipeline will be noted immediately and corrective action taken quickly.

Interior view of Columbia's Gulf's Corinth, Miss., compressor station showing one of four identical Cooper-Bessemer turbocharged and turbocooled LSV-16-SG engines. This engine, with a rating range from 3500 to 5,000 hp, drives a Cooper Bessemer RFB-24 centrifugal compressor through a Western Gear 16.82:1 speed increasing gear shown at the far left at the drive end. Note CFC Fulflo lube oil filter in foreground.

100 DIESEL TAXICABS FOR LOS ANGELES FLEET

By JAMES JOSEPH

AN experiment has become a trend as a major-city cab company orders 100 diesel taxis, the most significant switch to dieselization in the taxicab industry's history. Big Yellow Cab Company of Los Angeles, which but nine months ago put six experimental diesel taxis on Los Angeles streets, has made it official: Of 200 new cabs Yellow has on order for 1960, 100 are dieselized . . . specifically, the Mercedes-Benz 190-Db, with its 4-cylinder, 115.76 cu. in. displacement diesel engine rated 55 bhp at 4000 rpm. Confirms Yellow's Superintendent of Maintenance, Sid Henderson, "by mid-June, fully 10% of our thousand-cab fleet will be dieselized."

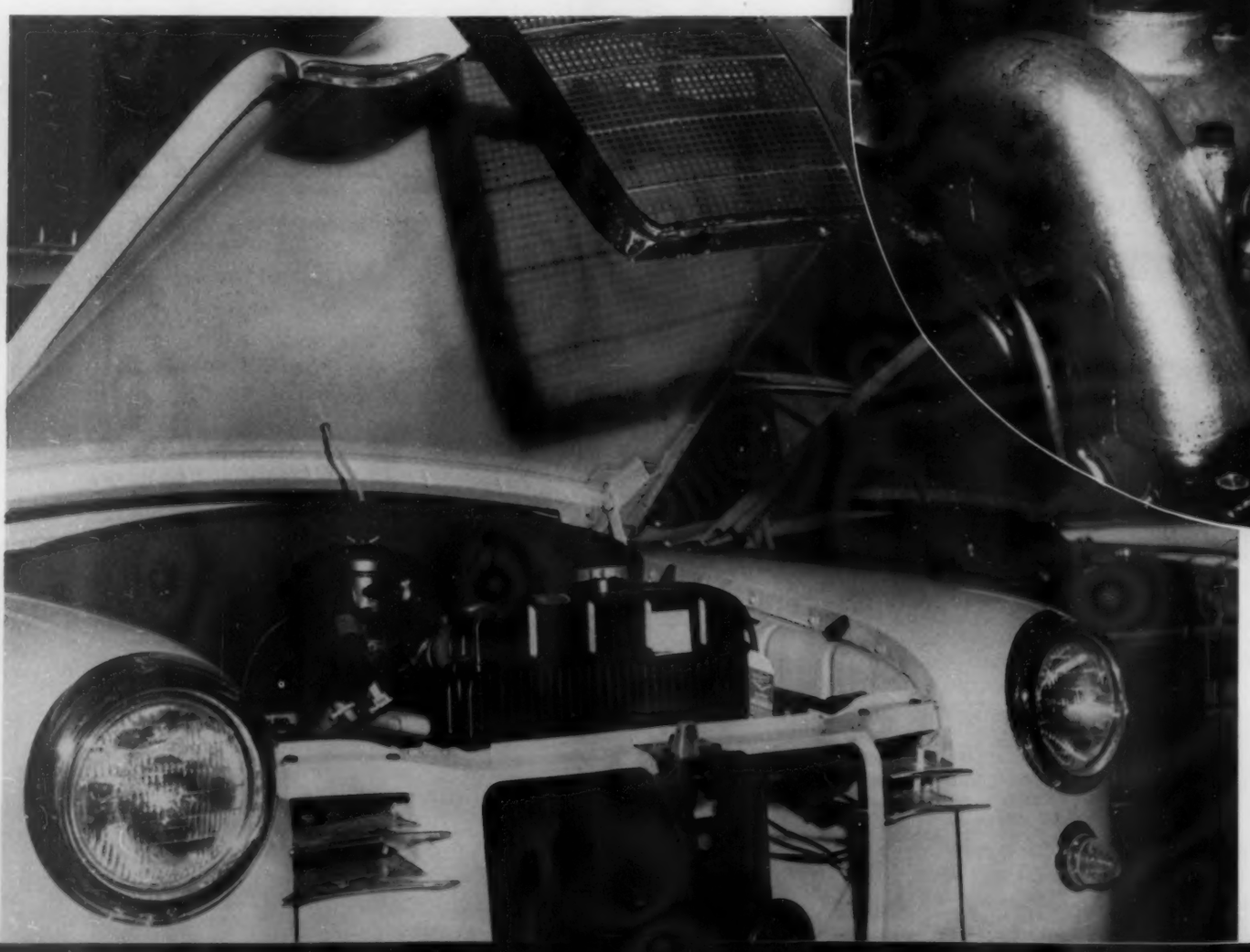
Thus Yellow Cab of Los Angeles becomes the U.S.'s largest diesel taxi fleet, and the company, a leader in what, nationwide, has all the earmarks of a big switch to in-town dieselization. The Los Angeles franchisee's trend toward diesel cabs may portend even more dieselization to come. Reason: Yellow Cab of California also operates franchises in San Francisco (500 cabs) and in Oakland (200).

Last year, when Yellow Cab of California put on the streets its experimental units, company management termed the move strictly a pilot operation. "The experiment," said Yellow Cab, "ought to last for about three or four months so we can really put the diesel engines through their paces. Depending upon certain factors, we hope eventually to dieselize our entire fleet in California. We'd also like to switch to diesel on the 100 or so lightweight city trucks we run in the state of California."

Though Yellow Cab of Los Angeles' executives haven't yet revealed how many diesels will be among the some 300 new cabs scheduled for purchase in 1961, maintenance chief Henderson concedes, "we're pretty much diesel-minded around this shop." One fact is certain: never before has a U.S. taxi fleet allotted, as has Yellow Cab of LA, anything like 50 per cent of its annual new cab purchasing to dieselization.

Yellow's big trend toward dieselization is soundly based on shop-proven economics. Says one cab executive, "with labor and parts costs rising, we've got to cut expenses somewhere simply to stay on the streets." The taxi industry's problem is acute. Many cab companies and their managements feel

Lube oil gasket seals top of engine . . . another anti-fume device which favored the diesel engine over Yellow's low-mileage-getting gasoline cabs.



Some of Yellow Cab Company of Los Angeles' 100 new diesel cabs . . . biggest U.S. fleet of diesel taxis to date.

they've reached a kind of fare plateau. While state public utility commissions might grant additional fare hikes, many doubt that passengers would pick up the increased tab. Result: hemmed by a kind of ceiling on fares, cab companies are desperately hacking at costs, especially in maintenance and mileage expense items.

Yellow Cab Company of Los Angeles' gasoline-versus-diesel operative figures tell the cost-reducing story. Yellow's diesel cabs have been averaging about 30 mpg compared to but 13 mpg for gasoline cabs. Thus Yellow gets nearly 2½ times the mileage from its diesels and spends from 1½ to 2-cents less per gallon for fuel. Says Henderson, "fuel savings aren't the real criteria . . . what's racking up big economies is bonus mileage. That's our bread and butter."

Here are some recent comparative figures:

Engine	Cab	Miles Per Gallon (for month)	Total Miles Driven (for month)
6-cylinder gasoline	A	14.4	4061
6-cylinder gasoline	B	13.2	3979
Mercedes 4-cylinder (diesel)	C	31.2	2898
Mercedes 4-cylinder (diesel)	D	28.6	4061

Significantly, Cabs A (gasoline) and D (diesel) were driven exactly the same monthly mileage—4061 miles. Yet the gasoline engined managed but 14.4 mpg while the diesel averaged 28.6. "Statistics like that," beams diesel enthusiast Henderson, "just naturally turn us diesel-minded." So, too, do some other statistics. Yellow, which must replace gas-engine spark plugs twice or three times during a typical 50,000 mi. (8-9 months of driving), finds that for the same period only injectors on the diesels need cleaning.

Yellow's gasoline engines need major overhaul at least every 125,000 miles. On the basis of maintenance inspections to date, Henderson expects his diesels to run at least 200,000 miles before overhaul. "On those first experimental cars," he remembers, "I pulled the heads and ran a critical inspection every 5000 miles. We also took the same careful look at injectors. So far, we haven't needed to do a thing."

Yellow's Mercedes-Benz units are the 190-Db. Cars and their engines are factory standard save for heavy duty clutches and vinyl headlining (so linings can be cleaned). Yellow's switch to diesels is the more noteworthy because the company pays considerably more for its Mercedes-Benz cars than for the 6-cylinder gas engined Plymouths which comprise the other 100 cars it will buy this year.

Though the company hasn't revealed cab-costs for its latest 100-unit order, last year estimated that diesels cost about $3000 compared to $2000 for standard cabs. "We figure," says Henderson, "to make up the difference in about two years' time, and to go on from there for considerable savings over the next two years of a cab's normal four year life." Henderson had put diesel fuel cost savings at about $400 per cab a year. He also figured to slice about one-third from the normal $440 yearly per cab maintenance bill.

Yellow Cab Company of Los Angeles, like others across the country, put its first experimental diesels on the streets with some trepidation, but public acceptance has been remarkable. Despite slightly more engine noise at low speeds, Yellow Cab of Los Angeles reports it hasn't heard a single complaint about the diesels. As significant is the fact that drivers are clamoring for diesel cabs. "And," says Henderson, "you can bet they wouldn't want them if fares had any complaints."

Cab's Mercedes-Benz 190-D engine vents crankcase fumes back to air intake . . . . another factor which makes this engine among the highway's least smog-contributing.

An admitted secondary reason for Yellow of Los Angeles' diesel enthusiasm is the engine's clean bill-of-health dispensed by Truesdail Laboratories, Inc., an independent lab which tested the experimental units (see DIESEL AND GAS ENGINE PROGRESS September 1959). Among Truesdail's findings: "The diesels produced substantially reduced concentrations of carbon monoxide, total olefins and hydrocarbons measured as n-hexane during all phases of engine operation." Said Smith Griswold, executive head of Los Angeles County's Air Pollution Control District: "these small diesel engines produced far less smog forming hydrocarbons than ordinary gasoline-powered engines." Yellow Cab Company of Los Angeles' president, George Worster, emphasized that his company makes no claim that adoption of diesels, even in a fleet of 1000, "is going to clear up our (Los Angeles) skies, but we do think that we're helping the situation a bit." Smog reduction was an important factor, conceded company executives, for their trend toward dieselization. Said Worster, "we wouldn't have proposed the change from gasoline if this would have made Los Angeles smog worse and we're delighted that it might make it better."

Spurred partly by Yellow Cab Company of Los Angeles' trend toward dieselization, but also by the developing trend nationwide, engine designers are bidding for the taxi potential: General Motors is already taxi-testing its GM 3-53 (3 cylinders, rated 97 bhp at 2800 rpm). Mercedes-Benz is closely watching developments as is Perkins, whose P4C-4 is also being tested by a number of U.S. taxi fleets. Hercules has just brought out a new line of small engines, some of them being run by Checker cab. Two in particular are bidding for taxi acceptance: Hercules' 3-cylinder model DD-149-H (46 hp at 2600 rpm) and its 4-cylinder DD-198-H (72 hp at 2600 rpm). American Marc is also known to have a lightweight diesel engine on its drawing boards. Mercedes-Benz cabs in use or on order in this country total about 120, other than the 100 ordered for Los Angeles. In addition there are approximately 500-550 Mercedes-Benz diesel taxis in use in Toronto and Montreal.

TWO 1200 HP FOSS FLEET TUGS

High Horsepower and Excellent Maneuverability Characterize the *Shannon Foss* and the *Carol Foss;* Each Powered by Nordberg Diesel

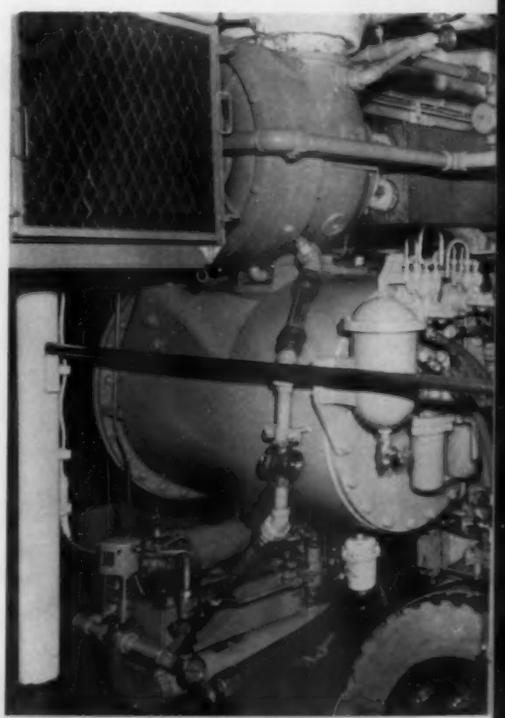
It's more than 70 years since the Tugboat Annie fleet was established on Puget Sound by Andrew Foss and his sagacious wife, Thea. But today's management of the Foss Launch and Tug Co. continues to strive for improvements in the design, power, efficiency and comfort of its vessels. The *Shannon Foss* and *Carol Foss,* new members of the big family fleet, exemplify the many design changes and improvements developed over the years on Foss ship-handling tugs. The two tugs are identical, although the *Shannon*—having gone into service in Mar., 1958, is senior to the *Carol* by four months. Both are powered by 1200 hp Nordberg Supairthermal engines.

Since the 1930's Foss engineers have been introducing ideas that would increase the efficiency of tugs used primarily to dock and undock big ships. The stern of the *Peter Foss,* a wooden hulled workboat built in the thirties, began a trend toward a unique stern design and the Foss engineers and skippers were encouraged by the results. When the *Brynn Foss* was laid down in 1954, the Foss engineers and their naval architect, H. C. Hanson of Seattle, carried the idea still further. The *Brynn* is steel-hulled and is powered by an 800 hp Nordberg Supairthermal diesel. Although she is smaller than the two new tugs, her appearance is so similar to her newer and larger sisters that it is impossible to distinguish between them at a distance. (The *Brynn* is 67 ft. long, 21.3 ft. of beam with a draft of 10.7 ft.) The engineering ideas and objectives that went into the *Peter* and *Brynn* were carried still further in designing the *Shannon*. The tug is 84.9 ft. at the waterline; 90 ft. overall. She is extra beamy at 24.3 ft. and her draft is 12 ft. Todd Shipyards Corp., Seattle, built the bare hull, but the Foss Seattle yard built everything above the hull and installed all machinery.

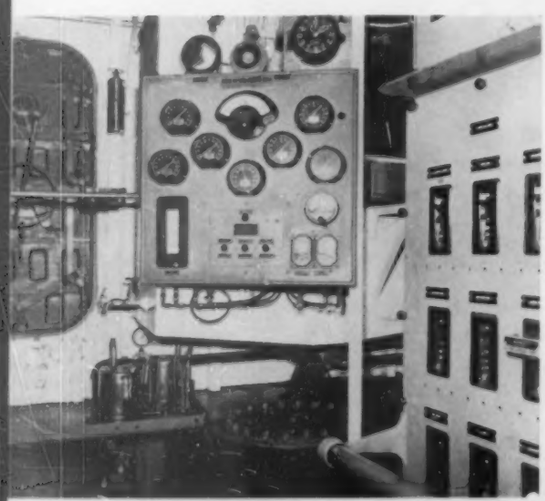
The Nordberg Supairthermal diesel is 4-cycle, direct drive, direct reversing, with 8 cylinders of 13 in. bore and 16½ in. stroke. Operating at 174 lbs. Bmep, the engine develops its rated 1200 hp at 310 rpm. It drives a 10¼ in. shaft with a 23 in. thrust bearing. The variable pitch propeller is 4-bladed, 84 in. dia. by 46.5 in. pitch. The engine-and-propeller combination, with the tug running free, makes it possible to turn the engine up to 385 rpm—which develops approximately 1600 hp—a highly desirable characteristic when the *Shannon* is being used in services where speed through the water is important, such as barge-moving and long tow trips. The engine is fitted with an Elliott high-pressure turbocharger with a filter on the inlet side. Ambient air temperature ranges between 90 and 100 plus degrees. Air is compressed to a maximum of 20 psi before going through the intercooler. A regulating valve, responsive to air temperature, controls the flow water through the intercooler to maintain the inlet air temperature at 120°.

An outstanding feature of the *Shannon* is her single-lever Westinghouse air brake engine control system. The skipper can control the engine from either the wheel house or the flying bridge. With the one lever, the pilot can start or stop the engine, reverse the engine or regulate its forward speed. The mechanism includes directional interlocking and provides a fixed slow-speed start to avoid jack-rabbiting on the towline. This system enables engine direction to be reversed in four seconds.

The tug is equipped with seven fuel tanks with a combined capacity of more than 30,000 gals. From the manifold, the fuel passes through a duplex primary filter and a cartridge-type secondary filter. A transfer pump at the engine sends the flow through a final duplex filter and to the injectors.

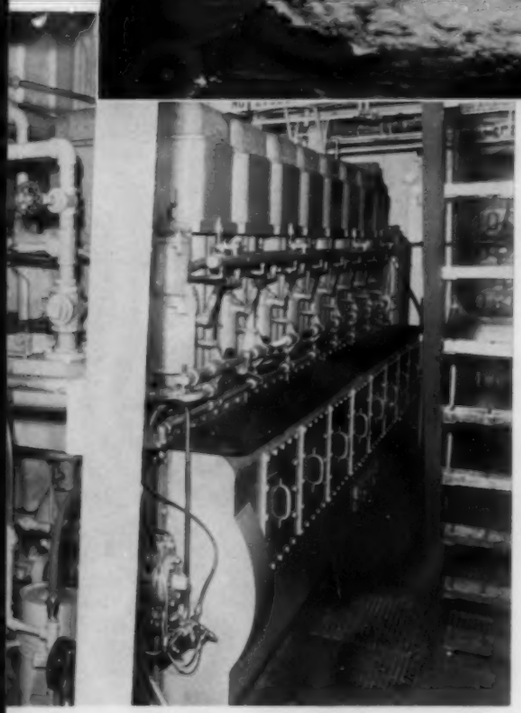


Good reserve power and single-lever, pneumatic engine control makes handling of ocean going liners just part of the day's work for the *Shannon Foss* and *Carol Foss.*

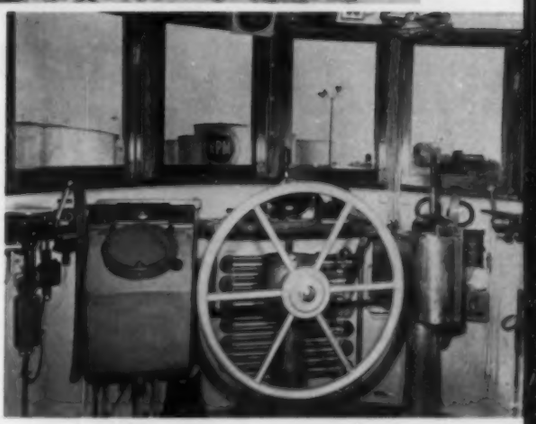


Engine room switchgear and gauge board aboard *Shannon Foss.* Note Alnor pyrometer and lower left, Nugent lube oil filter.

High powered twins of the Foss Launch and Tug Co. fleet are the *Shannon Foss* and the *Carol Foss*, shown in Puget Sound. Both are powered by Nordberg Supairthermal diesel engines rated 1200 shp at 310 rpm.



Stern view of 4-cycle, direct-drive, direct reversing Nordberg propulsion engine. Diesel is equipped with Elliott turbocharger, Air-Maze air filter and Perry water filter. Fulton-Sylphon regulating valve controls water flow to Young intercooler. Aeroquip flexible hose is used for 90% of lines.



View of pilot house on tugboat *Shannon* shows navigation aids and Westinghouse Air Brake single-lever engine control.

Lubricating oil is picked up in the main engine sump by a 5 x 4 in. pump and is transferred to the day tank. A pressure pump passes the oil through a full-flow filter into the heat exchanger. Before circulating through the engine, the lube oil goes through a strainer. A centrifuge is used to condition the oil and keep it up to operating temperature when the engine is shut off. The tug has an 850 gal. lube oil storage tank. Thermostatic control valves are fitted on both the lube oil and fresh-water coolers.

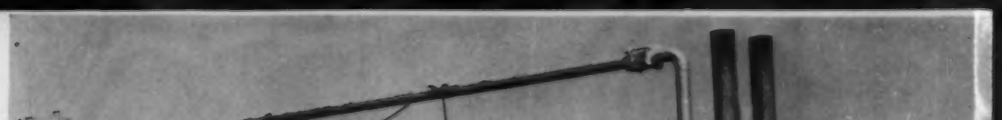
Credit is given the hydraulic steering system for the tug's superior maneuvering traits. While steering can be done manually with a wheel—and usually is on long-distance tows—the hydraulic system is preferred in ship-handling. The pilot has access to four hydraulic steering levers—one on either side of the wheel house and the flying bridge. Another departure from the conventional that marks the *Shannon* was utilization of flexible hose and fittings for 90 per cent of the lines on the main engine, on the auxiliaries, for the lube oil cooling system, and in the hydraulic towing and steering systems. It was also computed that this type of piping eliminated the need for nine 45° and seven 90° welded elbow fittings, eight sets of flanges, and 16 feet of piping. Engineers point out that considerable savings in materials and installation time resulted as well as fewer repairs and less downtime due to breaks and leaks in lines.

The bow anchor, the forward ship-line winch, and the after towing winch are supplied continuous power by two Cummins diesel auxiliairies. The 15 hp driving motor for the steering system is located in the after end of the spacious engine room, compactly mounted on a tank which contains both the oil filters and the controls for remote operation by means of pilot lines.

While the tug's primary job is to dock and undock ships, she performs other duties and is fitted out for emergency deep-sea towing. The Company regularly tows barges loaded with railway cars from Seattle to Bremerton, Port Townsend, Squamish, B. C., and Ketchikan, Alaska. The ship-handling tugs frequently draw these assignments, and they also are regularly employed in moving cement and petroleum barges about the Sound.

List of Principal Equipment on *Shannon*

Main Engine	Nordberg
Propeller	Olympic
Thrust bearing	Kingsbury
Turbocharger	Elliott
Governor	Woodward
Switch gear	Westinghouse
Spark arrestor	Vortex
Inlet air filter	Air-Maze
Intercooler	Young
Exhaust pyrometer	Alnor
Thermostatic valves	Amot and Fulton-Sylphon
Lube oil filter	Nugent
Engine air controls	Westinghouse Air brake
Air compressors (2)	Quincy
Water filters	Perry
Lube oil conditioner	DeLaval Separator
Flexible piping & fittings	Aeroquip
Auxiliary engines	Cummins



UTILITY SELLS HORSEPOWER AND CUTS IRRIGATION COSTS

PUMPS . . . plus engines . . . plus natural gas . . . combine to produce horsepower. This arrangement makes good common sense, too, from the standpoint of both supplier and consumer, believes Arizona Public Service Co. As a result, irrigation farmers in areas served by the utility are now able to purchase cheaper horsepower for their irrigation pumping and many arid tracts in the southwest are now sprouting fruit and vegetables. What's more, the farmers are doing it without having to own the horses!

Pumping irrigation water with gas-fueled engines, of course, is not in itself a new idea. Arizona Public Service has been supplying gas for such purposes for over a decade. Other utilities in the Southwest have been doing so equally long or longer. But the concept of selling "horsepower" instead of natural gas by the cubic foot is, as far as can be determined, an entirely new concept for the gas utility industry. The cost reduction—over current methods of energy supply—is made possible through the use of natural gas fueled engines to provide the pumping power, and a device that measures only the horsepower actually delivered to the pump shaft. By this means, the customer is billed only for the amount of "work" delivered—not for the fuel burned.

Two chief advantages to irrigation farmers under the new concept are the reduced cost of energy needed to pump water onto the land, and elimination of much of the investment that farmers are now required to make to perform such pumping. The utility's plan is designed to reduce the farmer's financial burden of owning, servicing, and maintaining pump-driving equipment, points out Walter T. Lucking, president of Arizona Public Service. The company will provide a gas engine, gearhead, and all accessories; it will also maintain, service, and operate the equipment for the farmers. For those farmers who prefer to own their own gas engines, the company has revised its extension policy under which new gas supply lines are built, and will now supply farmers with natural gas as required.

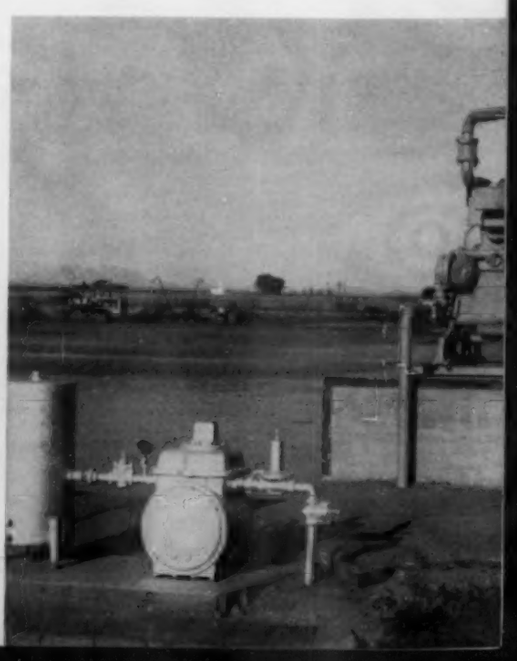
Can Save Nearly 11 Percent

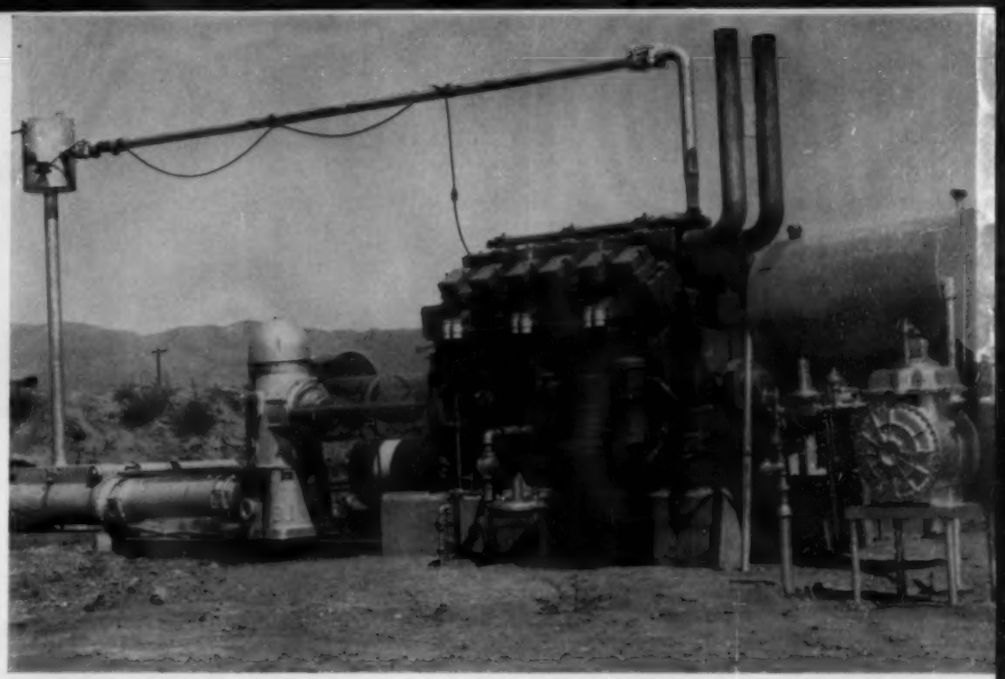
According to rate schedules filed with Arizona's Corporation Commission, the new "horsepower" service will afford average savings of nearly 11 percent over what the average farmer is now paying for electrical energy to operate his pumping installation. Farmers eligible for the new service are those owning or requiring irrigation pumps in excess of 50 hp. To date, Public Service sales personnel and farmers have had no trouble agreeing that the new service makes good sense.

Many months of intensive study and evaluation of Arizona's agricultural economy were carried out before the utility decided to embark on the program. (The company now provides natural gas service to more than 200 pumps serving over 40,000 acres. These pumps, however, are owned and maintained by the individual farmers.) An important part of the study program was a series of test rate comparisons made in six agricultural areas. These tests showed, that, where the farmer now spends an average 10.5 mills per kwh (including purchase and maintenance of electric pumping equipment), his cost under the natural gas "horsepower" plan would average only 8.6 mills per equivalent kwh—with the utility providing the engine and upkeep. The cost is based on 4000 hrs. annually, and costs vary depending on actual use of the pump.

Program Underway

The comprehensive program will be put into effect area by area throughout Arizona Public Service's gas service territory as rapidly as plans can be developed and equipment obtained. The company hopes to have the program available





Gas-fueled engines supply power for irrigation that helps cover these fields near Casa Grande, Ariz., with lush farm crops.

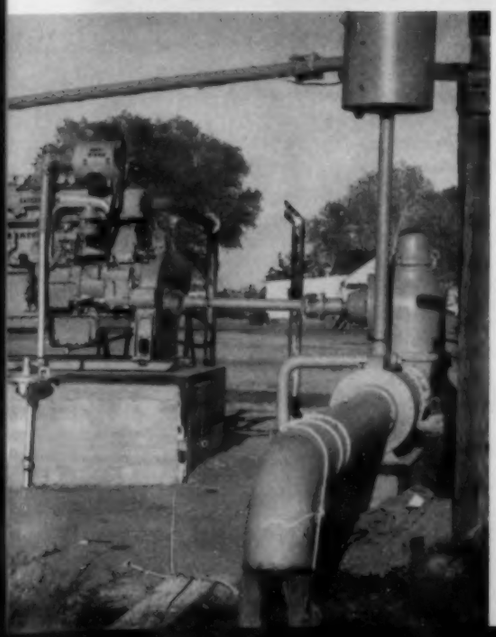
throughout its gas service system within two years. Under the program, a revised line extension plan allows installation of 15 ft. of piping for every horsepower of pumping load—up to a total cost of $15,000—at no cost to the customer. Gas engine servicemen will visit each pumping installation several times each week to log instrument readings and perform routine maintenance.

The program is mutually beneficial. Not only does the farmer benefit from reduced pumping costs, but the utility—in addition to increasing gas revenues and increasing gas consumption to its summer "valley" period—will be able to level off peaks in its summer electric load. In the areas selected, work has been underway for some time with 580,000 ft. of lines being laid. Estimated

Climax model V-125, 12 cylinder gas engine, rated 605 max. hp, drives irrigation pump in Arizona. Gas-fueled unit has bore and stroke of 7½ x 7 in. Note Winslow lube oil filter.

power-hours per year and could boost the company's annual gas revenues by $1,250,000. Magnitude of the program in its ultimate form might be seen in the fact that Arizona Public Service now serves 430,000 of the state's 1,240,000 irrigated acres, and provides energy to operate 1950 of the state's irrigation pumping installations.

In charge of the gas engine project is Earl Jorgenson, manager of the company's gas operations. Sales planning for the project is being supervised by Bill Kimsey, gas marketing manager. Joe Blazer, rural extension consultant, heads the field sales force, with salesmen in each of the company's divisions assigned to negotiate with customers. On special assignment from the engineering department to help develop the project are Howard Hersey, Dick Johnson, and Dick Keith. Property utilization manager Bob Franklin is in charge of major maintenance and repair of the gas engine installations.



This White Superior 6G-510 engine drives irrigation pumps at Queen Creek. The six-cylinder, 360 hp, gas fueled unit is equipped with Ross lube oil coolers, Vortox air cleaners, Ensign carburetor and Twin Disc power takeoff.

Caterpillar model 342 gas fueled engine drives a 10 in. pump to supply about 1200 gpm of irrigation water at the Henry Kochsmeier farm near Casa Grande. Engine operates 24 hr. per day, every day during six month season, to help supply water for 215 acres of cotton.

cost to Public Service for providing service to all six areas ultimately is approximately $11,000,000 for gas engines and accessories, plus another $3,000,000 for gas line construction. Approximately 690 engines that will be required in the project would deliver a total of 804,000,000 horse-

Use Plastic-Coated Pipe

"A big pile of long, yellow pencils" is the way one workman described the stacks of bright yellow pipe being unloaded at Buckeye, Arizona, for Arizona Public Service Company. In a way, he was right. Destined for use in the company's gas engine project for irrigation pumping, the polyethylene-covered steel pipe is made by Republic Steel Corp. The high density plastic coating, made by a low pressure process, is extruded onto the pipe at the mill. It is so tough, notes Frank Buck, gas engineering supervisor, that nothing in the soil can hurt it except a farmer's plow. The company tested the pipe for four months before purchasing it in quantity and believes that savings through its use will result from: faster field joints; longer lengths of smaller size pipe may be used efficiently; less damage to coating from handling; and reduced storage problems.

RESILIENT DRIVE LINES FOR DIESEL EQUIPMENT

By JIM BROWN

Shown above are examples of the Spicer 1700 series short coupled and two joint assembly rubber element shafts.

TORSIONALLY resilient Spicer drive lines manufactured by the Dana Corporation are custom engineered products which have found increasing application with the growing use of midship-mounted transmissions in large equipment. The necessity for a short drive shaft between the engine and transmission either brought about or emphasized the effect of torsional resonance periods in the drive system. When such resonances occur in the operating speed range, vibrations, noise, and in many cases actual failure of parts in the engine or transmission may be caused.

Resonance is the thing which many of us since childhood have observed in one form as "sympathetic vibration". When an airplane passes low or when a large truck roars by, certain objects in a house may be seen to tremble or dance, and may themselves give off noises in response to the vibrations set up by the plane or truck, while others do not. Similarly, a musical note may set other objects to vibrating. It is claimed that some opera singers have been able to break empty wine glasses by singing. Actually these things are examples of resonance. Resonance is defined as "an abnormally large response of a system having a natural frequency to a periodic external stimulus of the same, or nearly the same, frequency". In the cases mentioned immediately above, the resonance is between sound waves set up by an external object and some other object which is "in tune" with it. In the case of torsional resonances, there is an actual physical connection between the two or more components of the system.

Internal combustion engines do not exert a smooth, continuous-level torque or twisting action upon the drive line system to which they are connected. Even though the momentum of the engine flywheel, clutch and other rotating parts tend to smooth them out and cushion them, the firing action from the cylinders still imposes impulses into the system. This is graphically shown in Figure I, curve A. When there is irregularity in the engine's firing, as for example when one cylinder misfires, a different frequency of impulses would be imparted into the drive line system, and this frequency must also be taken into consideration. The effect of this is shown in Figure I, curve B.

In a properly functioning engine there is a torque impulse imparted into the drive line system, the frequency of which is equivalent to the number of cylinders firing per revolution times the number of revolutions per minute. As the engine is speeded up, the frequency of impulses per minute is increased. When the frequency of the engine impulses coincides with the natural frequency of another member of the drive line, resonance normally occurs.

The effect of drive line resonance may be likened to the effect of one person pushing a swing in which another rides. If the push given to the swing is in tune with the motion of the swing (i.e., in the same direction the swing wants to go and at the same time) then it takes only a small amount of effort to make the swing go higher. The swinging motion is actually amplified. This is resonance. If, in another case, the swing is pushed out of phase, it will slow down and you have a non-resonant condition. This principle is used in determining the proper spring rate of the torsionally resilient drive shafts for midship mounted transmissions and for other drive applications.

In every drive line there is a period when resonance of the components will occur. The object is to keep the resonance out of the operating range of the drive line system. Dana engineers strive to place the resonant frequency of the drive line system below the idling speed of the engine. When this is accomplished, the drive line system normally operates above resonance or at a post-resonance condition, and the drive line system will operate smoothly from idle speed on up through maximum speed.

International Harvester 295 Payscraper, equipped with a Spicer rubber element shaft.

Oddly enough, if the resonance period is placed at cranking speed, the engine cannot be started. Therefore the lower limit for resonance must be above cranking speed and the upper limit must be below the idle speed. It is desirable to have the resonant frequency at approximately one-half idle speed, and only a fine line of variation is permissible. Figure II shows the disturbing force compared with the imparted force at multiple frequencies of resonance.

It is not our purpose to write an engineering treatise on this subject. However, we will point out that there are other factors besides frequency of torsional vibrations to complicate the problem. One of these is mass, and the relationship of the weight of the driving and driven parts. John Kayser, chief engineer of the Universal Joint Division at Dana pointed out that when the driven assembly is relatively light, as in the case of a small air compressor mounted on a truck engine, it becomes increasingly difficult to provide a solution to the problem of torsional resonance. Sometimes in such cases it becomes neccessary to add a flywheel to the driven mechanism to increase its rotational mass with respect to the mass of the particular prime mover.

Low frequency drive line resonance is achieved by Dana engineers in providing a resilient drive shaft; one with just the right amount of "give" to it and yet capable of transmitting all the torque the engine will put out. The Dana resilient drive shaft consists fundamentally of two metal tubes, one within the other, between which a layer of natural rubber is sandwiched under compression. The power flow is from the engine and clutch through the outer tube, the rubber and the inner tube to a splined shaft which is in turn connected to the transmission, torque converter or other driven part. The drive shaft is supplied with one or with two universal joints and the splined shaft which fits into the innermost tube provides for variations in length.

In a company bulletin, the Dana Corp. has listed a number of things which their engineers must know before they can make recommendations as to the proper Spicer resilient shaft for a given application. These factors include:

1. Maximum net engine torque
2. Maximum and minimum engine speed
3. Number of cylinders; firing frequency and cycle of engine
4. Mass moment of inertia of engine package

Large Kenworth earthmoving truck equipped with Spicer short-coupled resilient drive shaft.

5. Mass moment of inertia of driven transmission

If the transmission is driven through a converter, the mass moment of inertia of the converter pump element alone is considered, since there is no rigid physical connection between the pump and the rest of the transmission.

Spicer resilient propellor shafts are said to offer other advantages for heavy duty, diesel-driven equipment besides the mitigation or complete elimination of torsional resonance; their torsional flexibility limits the effect of high impact loads resulting from rough shifts and other sudden torque changes; the cushioning effect prevents clatter, rattle and backlash noises; bearings, gears, splines and other components may be expected to last longer; noise transfer is reduced and their axial flexibility tends to cushion forces resulting from length changes. Another advantage of these drive lines over rigid metal shafts lies in their safety. In event of failure of the resilient shaft nothing happens except that it no longer transmits power. For this reason, as well as for their vibration dampening, they are considered a "must" on engine dynamometers.

The significance of Spicer resilient drive shafts has become reinforced by the constantly increasing power and higher rotational speeds of our modern diesel engines.

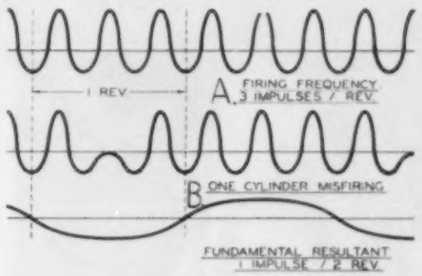


FIGURE I
FIRING IMPULSES FROM 6 CYLINDER
4 CYCLE ENGINE

Figure I: Firing Impulses from 6-cylinder, 4-cycle engine.

Figure II: Magnification of disturbing force.

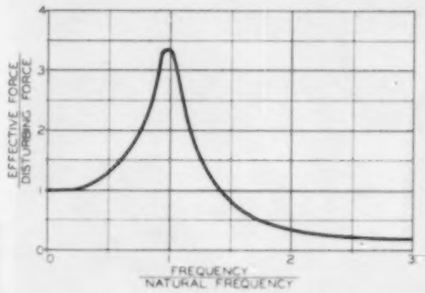
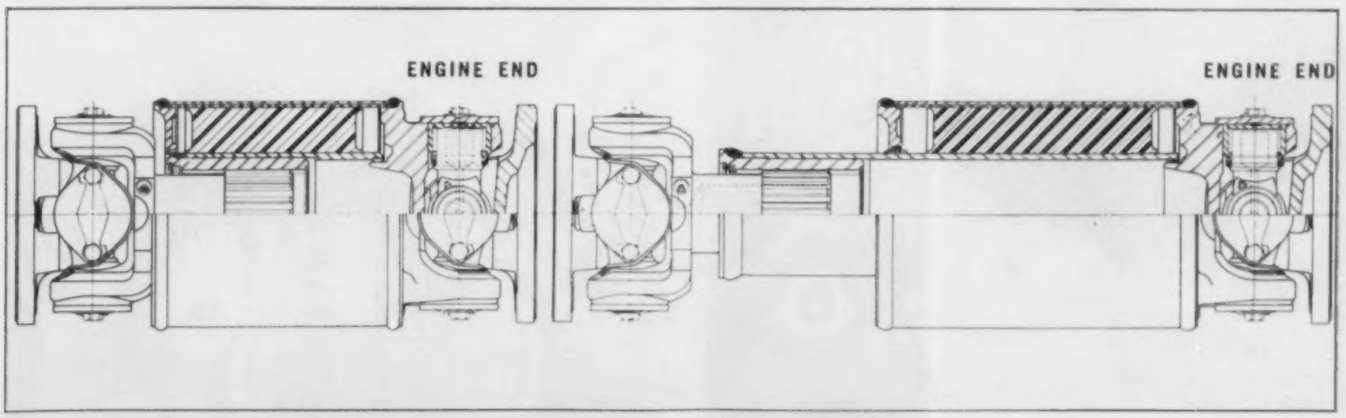


FIGURE II
MAGNIFICATION OF DISTURBING FORCE

Cross-sectional drawings of the Dana Corporation's Spicer resilient drive shafts.

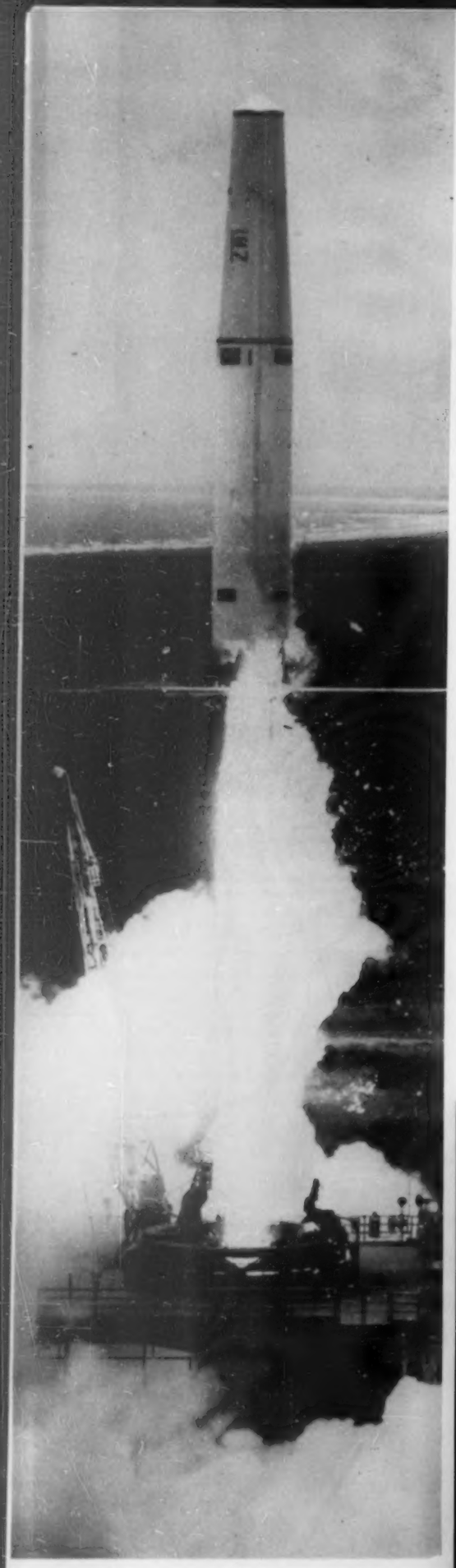


MOBILE ELECTRIC SETS FOR THOR MISSILE BASES

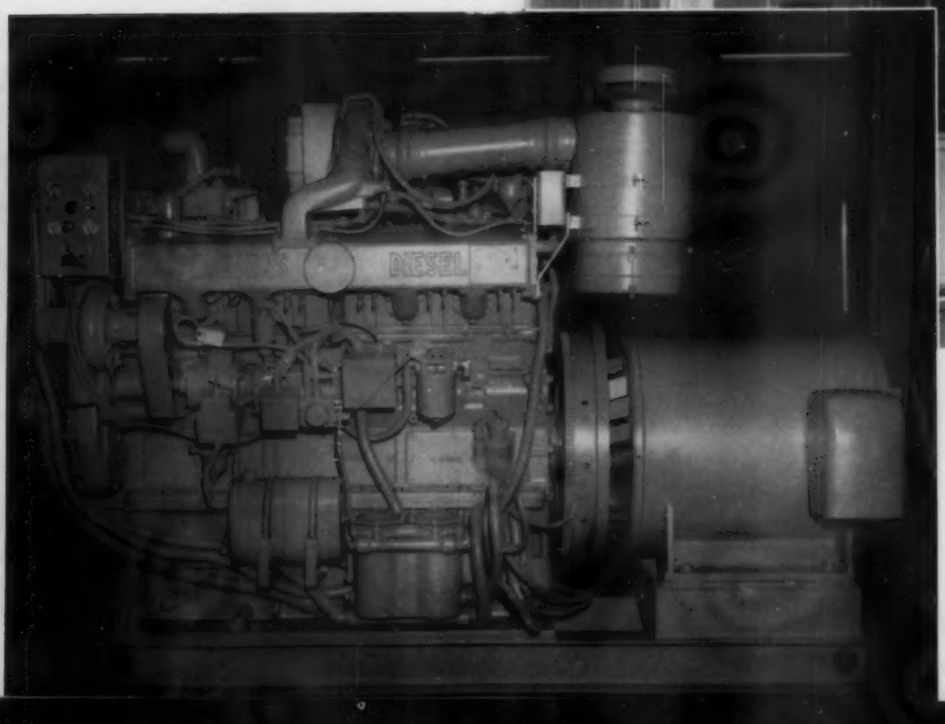
TRAILER mounted engine generator sets manufactured by Cummins Engine Co., under an Air Force contract are helping put the Thor rocket on America's firing line. The Thor is an intermediate range ballistics missile (IRBM) with a range in excess of 1500 nautical miles, and is this country's first operational ballistics missile. It was first fired in 1957 at Cape Canaveral, Fla., and later by an 11 man Air Force crew at Vandenberg AFB, Calif. The rocket has since been developed to the stage where it is ready to be turned over to the troops for tactical operations. Built by Douglas Aircraft Corp., it is 62 ft. long, and 9 ft. in diameter—and weighs 100,000 lbs. when on the pad and ready for firing. The Thor has an inertial guidance system which is set before firing and it is reported that no outside radio-type interference can throw the missile off its pre-set path. Thus far, also, no anti-missile missile has been developed to stop it. The Thor is considered a mobile weapon and the complete service package: missile, fuel, control station, troop quarters and power unit—are transportable on trailers.

A number of the Cummins-built engine generator units have been delivered and are reported giving satisfactory performance under the rigorous requirements of military use. The units are unique in that they must deliver power to precise limits and must be ready to do that job in any area of the world at varying altitudes and temperatures. Each engine generator set is mounted in a self-contained semi-trailer van which can be moved over the highway or in the bellies of huge C124 or C133 Air Force transports.

Heart of the installation (Air Force designation AF/M32A-12) is a Cummins 4 cycle, turbocharged VT-12 diesel engine, rated 575 hp at 1800 rpm when using No. 2 diesel fuel at sea level and an ambient temperature of 60 degrees F. The VT-12 has a bore of 5⅛ in., and a stroke of 6 in. Separate turbochargers feed each bank of cylinders which have wet type replaceable liners. The engine will operate on No. 2 diesel fuel, and in an emergency on JP-4 jet fuel or RP-1 fuel. The diesel unit is equipped with a Kim Hotstart water jacket heater, three lube oil filters, Penn safety shutdown controls, and standard glow plug starting equipment. It is designed to start automatically and come up to full speed and full load in 60 seconds. The



A Thor intermediate range ballistics missile leaves the launching pad in a test firing. Precise electric power for launching and instrument requirements are supplied by mobile diesel-generator sets built by Cummins.

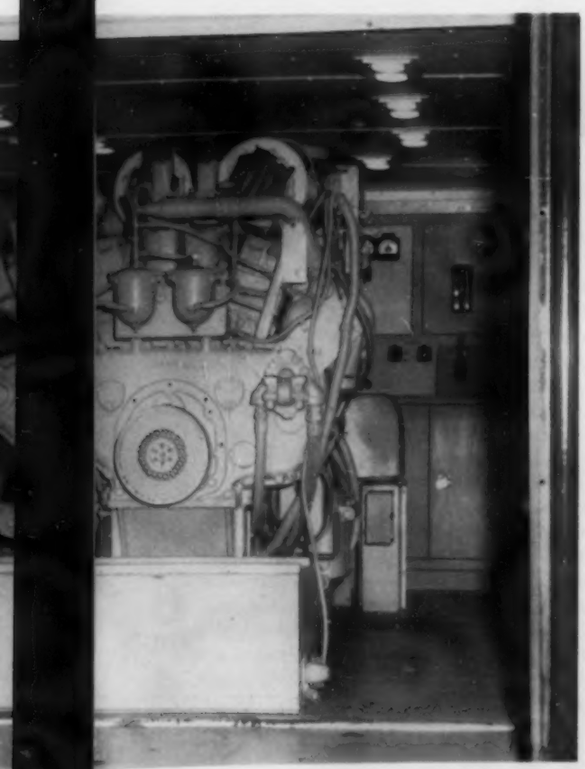


View of check area during pre-launch checkover. Mobile generator trailers are set up about 1000 ft. from launching pad when firing is carried out.

engine generator can also deliver 350 kw during a 15 minute overload condition.

The VT-12 diesel turns a special lightweight generator manufactured by General Electric Co. The generator is rated 480Y/277 volts, 60 cps, 3 phase, 4 wire, 0.08 pf, 250 kw continuous duty at 1800 rpm, with emergency output of 350 kw for 15 minutes. The single bearing, statically excited machine connects to the engine flywheel through a flexible coupling. A control console, also built by General Electric, contains switches, meters and other assemblies to control operation of the power plant. Power output from the generator is fed through the control panel to output receptacles at the front of the trailer. Incoming standby power and communications circuits are routed from the receptacles through the control console. Operations of the console can be controlled either manually or automatically.

The trailer van can be set up from 1000 to 1500 feet from the Thor launching pad and the Cummins VT-12 is equipped for automatic starting which can be handled from a remote location. The starting and synchronization cycle will bring the engine generator set up to its rated speed within the shortest possible time and then synchronize and parallel the unit with similar units which might be operating in the power hookup. Immediately after paralleling, the set is capable of accepting up to 140 per cent of its rated continuous duty load for up to 15 minutes.



Engine-generator set mounted in the trailer van. Control board is at front end of the 21 ft. long trailer. One turbocharger serves each bank of the 12 cylinder Vee-type engine.

Cummins VT-12 diesel engine drives special General Electric 480Y/277 volt generator to supply electric power for Thor missile unit needs. Turbocharged VT-12 engine is rated 575 hp at 1800 rpm.

Special trailer carries diesel engine-generator set and controls in compact, 21 ft. long package.

A control panel mounted on the engine allows the operator to make routine engine starts. The panel is equipped with gauges and switches for manual starting or checks during manual or automatic operation. The engine generator set is equipped with a Westinghouse Electric governor to hold output frequency of the generator within one-quarter per cent and, at any constant load from no load to full load, does not permit frequency modulation (number of times per second at which the frequency varies from average frequency in a regular or cyclic manner) to exceed one cycle per second. The governor incorporates an electric load sensing element which permits automatic load sharing during parallel operation. The range of frequency adjustment is from five to 63 cps in either manual or automatic operation. Following any sudden change from no load to full rated continuous duty load the governor re-establishes stable engine operating conditions within one second. The maximum transient frequency drop does not exceed 1.5 per cent of rated frequency during this time.

The engine generator set trailer unit is self contained and designed to perform as a remote controlled, automatically started and operated power unit with a minimum of operating and maintenance personnel. The trailer is 21 ft. long, 8 ft. wide and 11 ft., 2½ in. high. Wet weight, with a dolly for conversion to full trailer operation, connected to the kingpin is 30,220 lbs. Total wet weight without the dolly is 27,310 lbs. The trailer has eight automatic air intake doors, two access doors, two ventilating doors and a double automatic radiator door for exhaust. The Cummins engine cooling requirements are served by a large capacity Perfex radiator with motor driven fan. This radiator is large capacity in order to efficiently cool the engine under all types of climactic conditions. The trailer is equipped with air brakes suitable for use with an M52 tractor and capable of stopping both trailer and tractor within 60 ft. at a speed of 20 mph. Mechanical parking brakes can hold the trailer stationary on a 15 per cent grade.

The trailer van is separated into two compartments by a watertight, removable bulkhead. The engine compartment encloses the engine generator set and switch gear and is watertight. The second compartment encloses the radiator and is not watertight. The van is sealed against penetration of moisture into the van or the interior of the wall panels. Wall and ceiling panels are of metal-clad construction. The engine compartment is heated with a 60,000 btu multifuel Stewart-Warner South Wind space heater.

NEWEST REEFER CARS HAVE 2-SPEED ENGINES

By JAMES JOSEPH

BIG Pacific Fruit Express has rolled out its newest mechanically refrigerated car—first of 1025 PFE will build and, by all odds, the most modern to ply U.S. right-of-ways. In-car, movable dividers compartmentize the 50-ft. long, 120,000-lb. load limit all-welded cars—permitting any of three less-than-carload consignments to be segregated, one from another. Doors hang from four longitudinal overhead rails, locked in place to partition each type cargo.

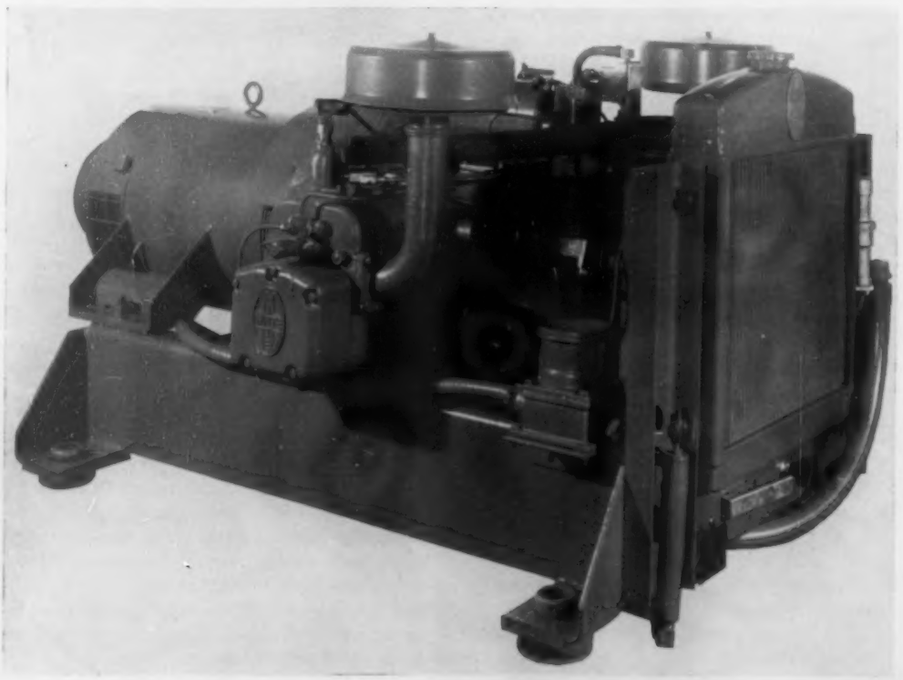
The Witte 100RDA, Type E, diesel-electric sets—powering Trane refrigeration units in 700 of the cars—literally "think for themselves": engines rev to 1800 rpm for "pull down," then drop to a fuel-saving 1200 rpm to "carry" the load. Operational criteria calls for low-speed operation during about 90 per cent of engine run-time. The refrigerated car's loading doors are sheathed interiorly with a corrugated plastic liner—a kind of insulating sandwich, its voids filled with foamed-in-place polyurethane, newest of cold-sealing quick-set plastic insulations. Automated engine "unloading" drops the refrigeration load if the engine heats up at high altitudes or on long desert runs (or when car is sidetracked), allows engine to cool, then pick-up load . . . rather than, as in previous installations, to shutdown completely.

But perhaps most significant is PFE's accelerated trend toward economic, lower horsepower, fuel saving diesel power plants—such as Witte's 100-RDA unit and Detroit Diesel's 2-53 which will be used in 300 of the new cars. In the early days of mechanical refrigeration—back just after the war—railroads were pretty much dedicated to higher horsepower for reefer car diesels—power in the 25 to 35 hp class. Now, two-speed operation and refinements both in car construction and in refrigeration have sparked thinking toward diesel sets in the 18-19 hp, 12½ kw range. As significant is the fact that refrigerated car designers can today safely think in terms of the *minimum*, rather than maximum power—confident that near-minimum diesel power, combined with refined refrigeration, can hold temperatures to the design-required –10° F or heat cars to 70° F. Earlier, designers thought in terms of maximum power—as a hedge against possible equipment failure or overload.

Result of this downward trend in hp and kw requirements: PFE nowadays gets diesel dependability at less first cost . . . and expects to spend less, operationally, too. PFE figures its newly programmed two-speed diesels to shave fuel costs by 20%. Why? Simply because at lower operational speed (1200 rpm), engines burn approximately .6 gal/hr. compared to consumption of approximately .81 gal/hr. at continuous speed of 1800 rpm.

But let's take a closer look at this, perhaps the largest mechanical refrigeration car-building program currently in progress: Of the 1025 new 50-ft. cars PFE will build at its Taylor Yards (in Los Angeles), 700 will be powered by Witte 100RDA, rated 19.1 hp at 1800 rpm, the two-cylinder, 4-cycle, horizontally opposed, 100 cu. in. displacement engines (with a bore of 4 in., a stroke of 4 in.) directly driving 12½ kw brushless Electric Machinery generators. Output: 230 volts, 3-phase, 60 cycle; 300 of the programmed cars will be dieselized with GM 2-53, 106.1 cu. inch dis., 2-cylinder, 2-cycle engines driving Delco brushless generators. With a 3⅞ in. bore, a 4½ in. stroke, the 2-53's are rated 23 hp at 1200 rpm 14.9 hp at 800 rpm (and probably be governed, like the Wittes, to operate at the lower rpm during much of their run); 25 cars, their engines and refrigeration equipment yet unspecified, are labeled "experimental." If PFE follows precedent, the 25 experimental cars will road several engine-generator-compressor combinations, the aim is to test other car-potential units. Most of their diesels, it is said, will be in the 15-20 hp range to produce above 32° temperatures.

The first cars thus far rolled out for inspection, however, are Witte-engined, with Electric Machin-



Product view of the engine-generator set which powers the refrigeration system in the PFE cars described in this story. Witte model 100RDA engine is equipped with Roosa Master fuel pump and is rated 19.1 hp at 1800 rpm. It drives an Electric Machinery 12½ kw brushless generator.

Big Pacific Fruit Express has rolled out its newest mechanically refrigerated car—first of 1025 PFE will build and, by all odds, the most unusual to ply U.S. right-of-ways.

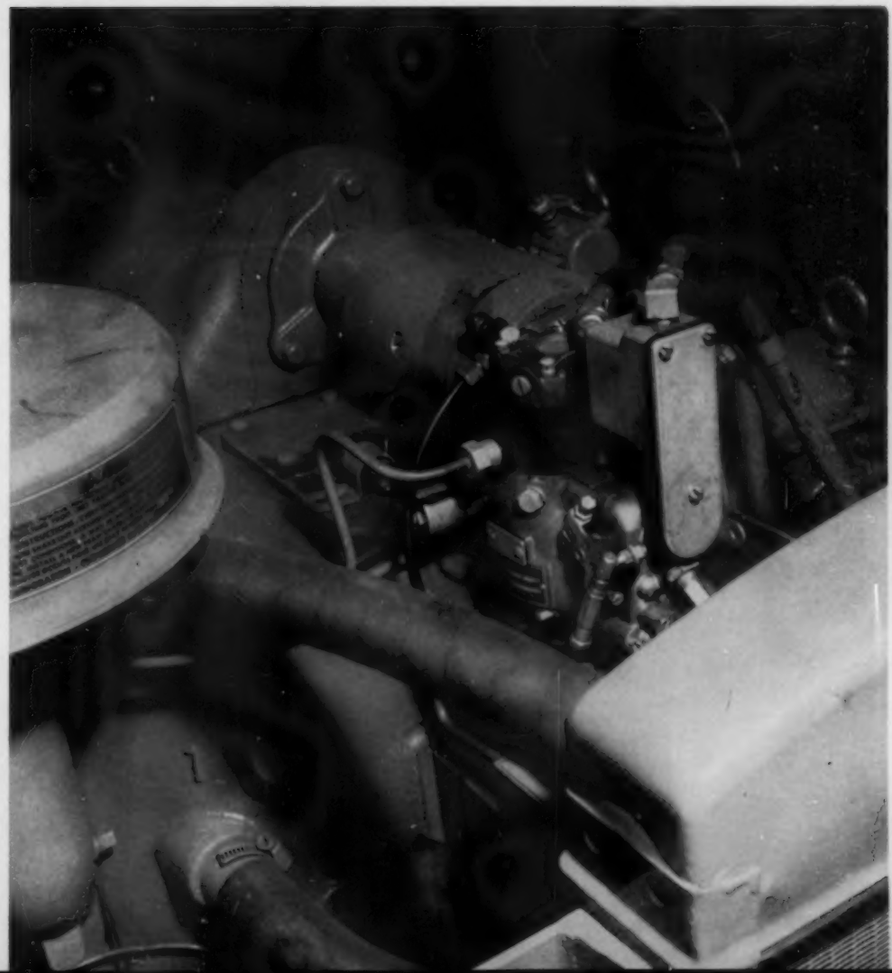
Two-speed operation is controlled by a solenoid and electro-magnetic coil in the Roosa Master fuel pump, shown here. Operating on "low speed" (1200 rpm), engine can normally carry the system thru its three cycles: defrost, refrigeration and heating. At left, one of two Fram air filters.

ery generators (12.5 KW at 1800 rpm) powering Trane IF5A33LN (Model F) compressors. Snugged into a car-end compartment, its start-stop and cold-weather starting controls reached from outside the car, the engine fuels from double under-car tanks, their combined capacity 500-gallons of No. 1 diesel oil. In the same compartment are housed the compressor, condenser, Westinghouse control panel, Partlow thermostat, engine starting battery and its charging rectifier. The Witte, like other programmed engines, is water-cooled, its radiator circulating a 50% mix of water and anti-freeze to prevent freeze-up and damage to the engine and cooling system.

Two-speed operation is controlled by a solenoid valve actuated by an electric signal from the car thermostat. The solenoid valve admits fuel under pressure from the supply system to an actuator piston in the Roosa Master fuel injection pump. This changes the pre-load on the governor speeder spring, thereby regulating engine speed. At low speed, the pressure on the actuator plunger is removed. Once car temperature is "pulled down" to thermostat setting, engine drops to low-speed (1200 rpm), doesn't operate full-speed (1800 rpm) unless load temperature rises about 3 degrees above the thermostat setting. Operating "low speed," the engine can normally carry the system through its cycles: defrost, refrigeration and heating.

Cold starting is achieved through an automatic retard mechanism, also built into the Roosa Master unit. During cold-starting, injection timing is retarded 12-degrees from normal run position. Retard is automatically triggered when the start button is depressed. Cold-starting is also aided by a cold-start capsule and hand-pump, which pumps ether into the manifold (or air inlet headers).

Automatic "unloading." Previously, some car engines shut down when water temperatures rose to a high point when, in fact, there was nothing mechanically wrong with the engine. The cause: excessive in-transit heat or, in some cases, a car was side-tracked and so screened by nearby cars that it got too little air. Once shutdown, engines had to be manually started. This problem is solved by "automatic unloading." In brief: when, for any reason, engine water temperature reaches 214-216°, the refrigeration load is dropped. Unloaded, the engine cools and, at about 200-206°, picks up the load again. If engine trouble exists, of course, the engine fails to cool—and when its temperature rises to 220-224°, the high-water safety control shuts off the fuel, thus the engine. Tests show that, normally, an unloaded engine cools enough to pick up its load in 10 to 20 minutes.



In-car, movable dividers compartment the 50-ft. long all-welded cars . . . permitting any of three less-than-carload consignments to be segregated, one from another. Doors hang from four longitudinal overhead rails, lock in place to partition cargo. Doors, despite their size, are extremely lightweight.

ment change. Most previous refrigerated car diesel sets used oil-bath air filters.

Brushless generator may shave as many as 6½ hours annually from routine generator inspection, mainly because, unlike brush-commutator units, they suffer none of the damage usual from dust and abrasives.

No battery-charging generator. Witte and GM 2-53 engines carry no battery-charging generators, once a common trouble point. Instead, a rectifier (rated 5 amps dc, 12-volts) reduces a small portion of the main generator's 230 volts ac to 12 volts dc to charge a single, 10-celled nickel cadmium battery (life expectancy: 20 years). The battery powers an engine starting (cranking) motor.

Fail-safe controls include a low-oil engine shut-off (if oil pressures fall below 18-22 psi) and a high water temperature shutdown solenoid (if engine water exceeds 220-224° F.).

Principal Equipment on Witte Units

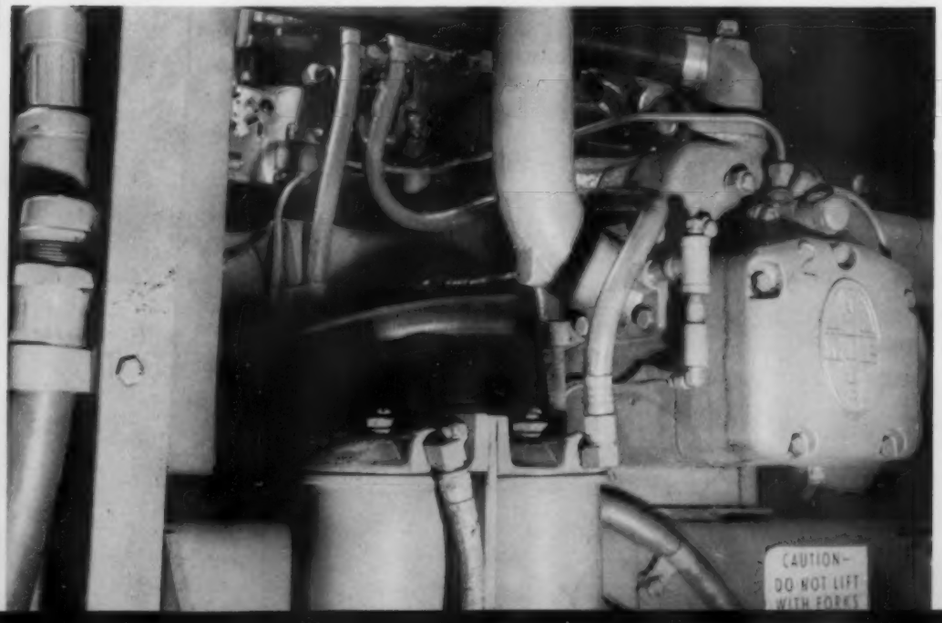
Generator	Electric Machinery
Compressor	Trane
Starting motor	Autolite
Fuel pump	Roosa Master
Air Filters	Fram
Oil filters	Fram
Fuel filters	Cfc Fulflo
Exhaust muffler	Nelson
Exhaust spark arrester	Nelson
Battery charger (rectifier)	Vapor Heating Corp.
Starting batteries	Sonotone and Nicad (Gould)
Electrical control panel	Westinghouse
Cold starting device	Cheveron
Fuel injectors	American Bosch
Radiator	Young
Thermostatic unloader	Reis
Thermostatic valve	Amot
Fuel transfer pump	Barnes

Fuel Injection Pump. The Roosa Master fuel pump combines seven functions: (a) acts as an injection pump, delivering fuel to the injectors; (b) has a built-in ½-pt capacity "day" tank which not only maintains a static head of fuel on the pump but automatically purges any air from the fuel system; (c) is the secondary fuel transfer pump; (d) governs engine speed; (e) contains the two-speed actuator which shuts the engine to low-speed operational rpm during about 90% of its run time; (f) contains low oil pressure shut-down safety device; (g) contains the fail-safe device.

Dry type air filters. Dry-type (Fram) air filters reduce pre-tripping time, permit quick filter-ele-

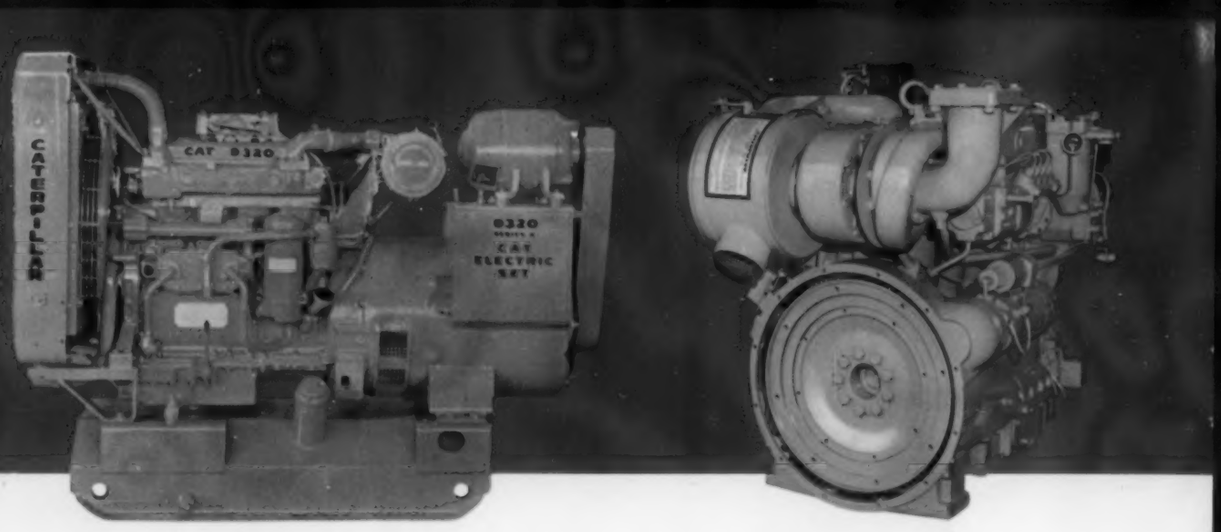
"Start" lever depresses start button and also actuates retard device when cold-starting. At left is oil level dip stick. At extreme right, the cold-start capsule and "pump" knob. All controls are reached from track-level, outside the car.

Trend toward smallness . . . the Witte 100RDA-B diesel engine which powers Trane refrigeration units in 700 of PFE's new cars. Low-shot of engine shows Cfc Fulflo fuel filters.



NEW COMPACT DIESELS
BY CATERPILLAR

Caterpillar announces a new line of four-cycle diesels that sharply reduces physical dimensions and weight-to-horsepower ratio. Features of durability, fuel economy and dependability, long associated with Caterpillar four-cycle diesels, are still apparent.



D320...130 HP
(Shown as Electric Set*)

D330...180 HP
(Shown as Industrial Engine*)

NEW FROM CATERPILLAR—HIGH OUTPUT, LIGHTWEIGHT, COMPACT DIESEL ENGINES

Since introduction of the first mobile diesel engine in 1931 Caterpillar engineers have been testing materials and methods to reduce diesel size and weight and at the same time develop more horsepower. Three products of this program are the new D320, D330 and D333. Their size, performance and price now offer significant and increased economic return to the user.

Now you can get premium four-cycle performance . . . and what is very important to you . . . at no premium in price.

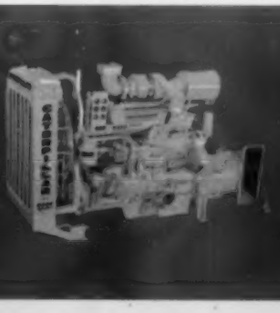
These engines and the rest of the Cat Diesel line are designed for your job or manufacturers' equipment whether it be industrial, electric power generation or marine.

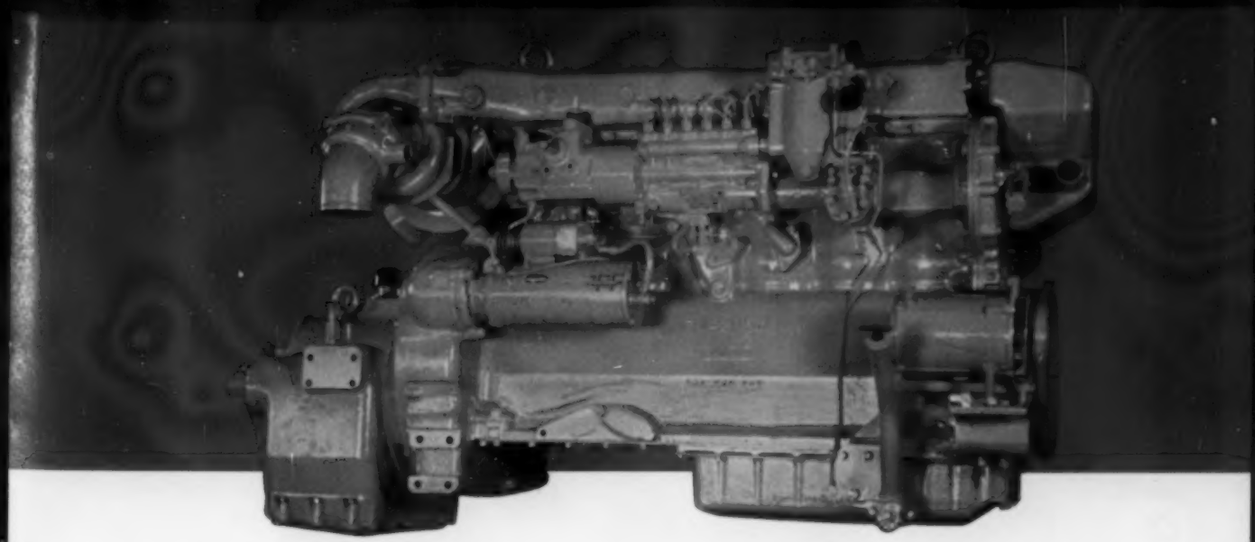
Shown below are more models. Space prevents the illustration of Caterpillar's complete line running to hundreds of configurations.

Caterpillar manufactures a full line of diesel and natural gas engines. Diesels range in horsepower up to 730; output of the largest electric set is 400 KW. Diesels are available in industrial, electric set and marine versions. Caterpillar also manufactures the lowest cost per horsepower natural gas engine on the market today. Hundreds of thousands of Cat Diesel predecessors to the new series have set performance and economy records, the world over.

D311H POWER UNIT

D337 EXCAVATOR MODEL





D333 . . . 270 HP
(Shown as Marine Engine*)

*All available in industrial, electric set, or marine configurations. These are maximum usable horsepower ratings with 85° water to aftercooler.

GOOD SERVICE LIFE Valve rotators insure perfect valve seating, give extended valve life. Turbocharging helps keep valve temperature lower. Pistons are spray cooled from underneath and cylinder liners are full length, wet type for better heat transfer. These features and many others such as elliptically shaped pistons and shot peened, fatigue-resistant crankshafts make this series dependable performers.

SMOOTH AND QUIET RUNNING All of these engines are smooth running. The four-cylinder D320 and D330 have built-in balancers that remove the roughness characteristic in four-cylinder engines. Turbocharging muffles exhaust noises to a point where mechanical muffling or insulation is not often needed.

ECONOMICAL These engines have a precombustion chamber injection system design which is non-sensitive and lets the engine digest lower-cost, heavier, higher-heat-content fuel. Being able to burn fuel such as commonly available household furnace oil compared to gasoline or premium diesel can save many thousands of dollars in fuel costs over the life of the engine.

DEPENDABLE These engines can idle for extended periods, then accelerate to full load and speed with a clean, clear exhaust. This ability to burn fuel completely over a full range of speed and load is the result of four-cycle design plus the use of a precombustion chamber injection system. It results also in better part load fuel economy.

POWERFUL The specification sheet horsepower is the horsepower you can use. There is no need for derating with a Cat Diesel. In fact, you can request and get a formal horsepower certification with each engine you purchase.

D342 MARINE

G375 NATURAL GAS

D397 ELECTRIC SET

Completed in 1959, the new Mossville, Illinois, Industrial Engine Plant manufactures Cat Engines on a mass-production basis.

Partially complete, Caterpillar's new Technical Center provides an appropriate research atmosphere and ultra-modern facilities. Two of these buildings are devoted to prime power research.

Basic in-line Diesel and Natural Gas Engines are also machined and assembled in this modern Peoria, Illinois, plant, completed in 1948. Another large plant (San Leandro, Calif.) manufactures fuel injection components.

FROM POWER CITY COMES MODERN DIESEL AND NATURAL GAS ENGINES PLUS DIESEL ELECTRIC SETS FOR EVERY POWER USE

The present diesel and natural gas engine line, the facilities and the manpower are all dedicated to give you the best diesel engine value on the market today.

We offer this value in new engines and the constantly improved diesel industry standards such as the D397 and D342. This value results from assembly line, mass-production economies, precision manufacture, 100% inspection, excellent metallurgical quality, modern, compact design, more than thirty years of diesel experience and a constant intent to offer engines at an economical price per unit of horsepower.

Whatever your diesel or gas engine needs may be, you can expect Cat to offer the most for a reasonable price, low operating cost and a low final cost.

Specify Cat and be sure of satisfaction.

CATERPILLAR

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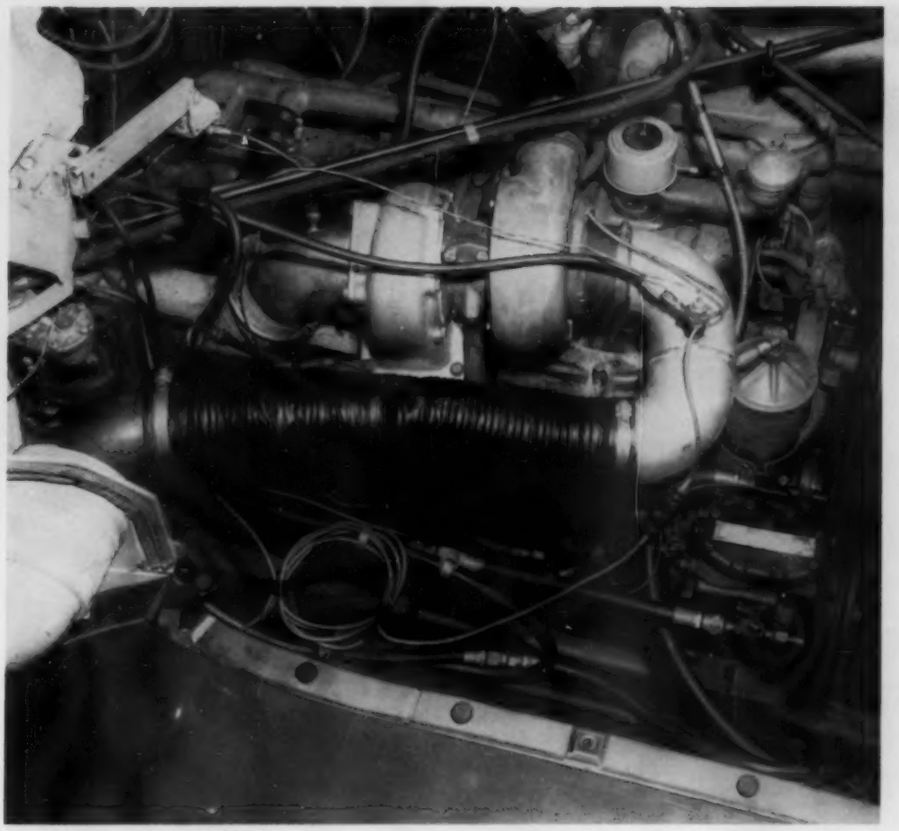


Development installation of new AiResearch model T-11 turbocharger on truck engine. Probes used to gather test data on operation of the new unit are visible.

NEW TURBOCHARGER FOR SMALL ENGINE APPLICATIONS

Design Refinements and Component Simplification In Model T-11 Unit By Garrett AiResearch Achieve Lower Cost While Retaining High Efficiency

A NEW small turbocharger for diesel engines in the 150 to 350 hp range is now in production at Garrett Corporation's AiResearch Industrial Division. Designated model T-11 and designed for high pressure ratio turbocharging with maximum efficiency, the new unit has a casing diameter of eight inches and weighs 35 lbs. This size and weight, according to AiResearch engineers, permits the turbocharger to be fitted into limited space installations, provides ease of mounting and eliminates the need for extra support for most exhaust manifold mountings.

In the design of the model T-11, Garrett has retained its established specifications in the critical rotating assembly turbine wheel, compressor wheel and shaft, but has achieved lower cost through design refinements and component simplification. One improvement, for example, is achievement of higher turbine efficiencies by using vortex flow in the turbine housing to produce high velocity gas entering the turbine wheel. This method, in addition, eliminates the need for a nozzle ring, thereby reducing costs. High compressor efficiency provides high airflow at low manifold temperatures and pressures, with proportionally better engine scavenging pressures.

Product view of AiResearch new model T-11 turbocharger. This new unit was designed for engines in the 150 to 350 hp range.

The star design of the T-11's turbine wheel, shown in foreground of rotating assembly, contributes significantly to the low intertia factor of the small, lightweight unit.

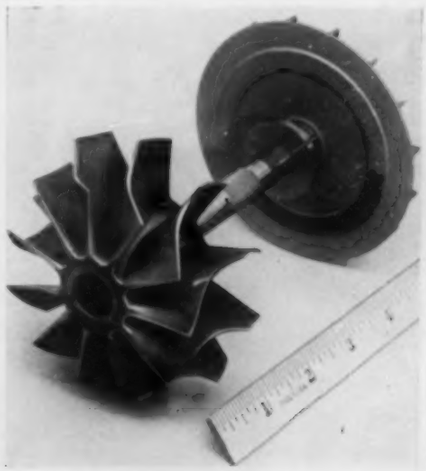
The AiResearch T-11 possesses very good inertia characteristics, giving it extremely rapid response. Most significant contribution to this characteristic is the star design of the turbine wheel. The turbine blades extend from a small diameter hub without a heavy back shroud. Taper and curvature of the blades increases stiffness and further results in lower stress level in the wheel.

With the higher pressure ratios that can be developed by the T-11, corresponding increases in engine horsepower are available. The higher ratio, according to AiResearch, gives greater margin of safety so the turbocharger is not readily overspeeded from overfueling or high altitude operation. The T-11 is designed for normal operating pressure ratios as high as 5 with additional margins for overspeeding.

Scope of the turbocharger's adaptability to a variety of engines is very wide. Design allows a great deal of flexibility in tailoring the aerodynamic and thermodynamic characteristics to fit specific applications. By modifications in machining of the compressor wheel and diffuser it is possible to perfectly match the requirements of engines from 150 to 350 hp. Similar modifications in the turbine housing and wheel permit optimum matching or turbine characteristics.

Configuration can be tailored to fit different mounting requirements. This is accomplished by rotating the compressor outlet to any desired angular position and the turbine inlet flange to one of various positions.

The AiResearch model T-11 is now a production machine after a development period of two years. During this time it has performed successfully with exhaust temperatures as high as 1600 degrees F. It has undergone extensive laboratory and field testing on diesel engines in earthmoving equipment, trucks and stationary power units.



DEMONSTRATE NEW 55 TON DIESEL ELECTRIC TRUCK

POWER, performance and bonus productivity are features claimed for the Lectra Haul, 55 ton payload diesel electric truck manufactured by Unit Rig & Equipment Co., Tulsa, Okla. The off highway vehicle was demonstrated recently at a stone quarry near Tulsa. Mining and contruction officials watched the 41 ft. long truck show its maneuverability and versatility in turning, climbing, stopping and dumping.

The truck was designed for open pit mining and for large scale construction operations. It is powered by a 600 hp (at 2100 rpm) Cummins VT-12 diesel engine which drives a General Electric model GT594-A generator to supply current for electric motors mounted in each of the four giant wheels. The traction motors are GE model GEZ 5227 series wound motors with integral planetary gear reduction system. The engine also drives an excitation generator, battery charging generator, air compressor, hydraulic pumps and front wheel ventilation blower. Use of the vehicle is expected to cut hauling costs from 10 to 30 per cent, according to Unit Rig officials.

The Lectra Haul was loaded with 55 tons of limestone and driven up a six per cent grade at 8 mph to demonstrate its ability to perform with a full pay load. The entire load was dumped in 23 seconds by means of hydraulic rams. The vehicle is designed to take grades up to 15 per cent fully loaded. To demonstrate the vehicles ability to turn in restricted areas, a critical operation in many mining and construction activities, the new Unit Rig vehicle made figure 8's in the same tracks as a conventional 15 ton dump truck with approximately ¼th the Lectra Haul's capacity. A roadway just 50 ft. wide is enough for the Lectra Haul to make a full 180 degree turn.

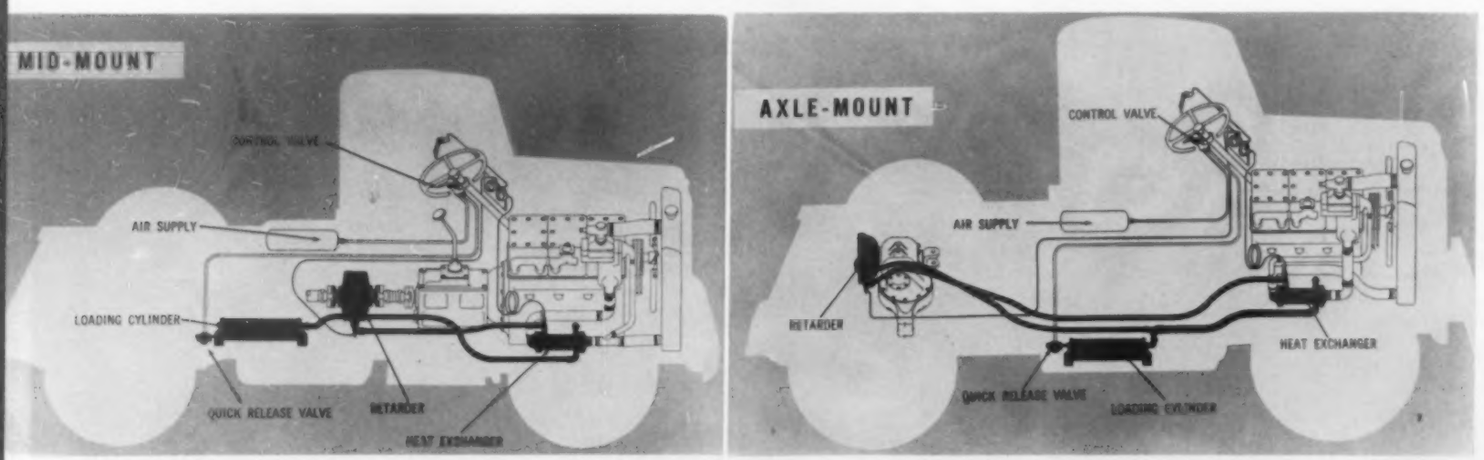
After leaving the bottom of the pit, the truck was run at a high rate of speed and the gross weight of 110 tons was brought to a fast, yet smooth and effortless, stop in front of the spectators. This showed the effective holding power available with electric motors for dynamic braking. No friction brakes are required for downgrade operation. Parking and emergency brakes employ hydraulic aircraft disc types on all four wheels. The vehicle has a conventional arrangement of steering wheel, foot throttle, brake pedal and other control.

Motorized wheel drive eliminates torque converters, transmissions, propeller shafts and drive axles, thereby reducing drive system maintenance. Electro-dynamic brakes, an inherent feature of the vehicle, provide highest continuous braking without fading or mechanical wear. Longer life, lower maintenance expense and maximum use of power and equipment are said to be a result of this all wheel drive system.

RETARDER SYSTEM FOR HEAVY PAYLOAD VEHICLES

AS weight and payloads of on and off-highway vehicles increase, engineers concerned with designing these units have run into complex problems as a result of the limited space available for effective service brakes. The space available makes it all but impossible to provide increased braking power in proportion to the increased combined vehicle weight and speed.

To compensate for the limited brake space available, some form of dynamic braking is often recommended to control speed of the vehicle, during deceleration and while descending long grades, without the use of the service brakes. Dynamic braking, unlike braking as normally considered, does not have as its object stopping the moving vehicle. Rather, its aim is to reduce speed or to resist acceleration when an accelerating force such as gravity is applied. As in friction braking, the energy of the vehicle in motion is transformed to heat but with dynamic braking, the heat generated is dissipated through the vehicle's cooling system. A retarder system now in production by the Thompson Products Michigan Division, of Thompson Ramo Wooldridge, Inc., consists of a mid-mounted or axle-mounted retarder assembly, an air-loaded loading cylinder, a heat exchanger and a cab mounted air switch. In the retarder assembly, energy of the moving vehicle is absorbed



Schematic drawings showing arrangement of mid-mount, left, and axle-mounted retarder systems.

Tiny foreign car barely reaches rim height of new diesel-electric truck. Power is supplied by Cummins diesel driving GE generator. Note Donaldson air cleaner.

Off-highway vehicle has motorized wheel drive. Current for GE wheel motors is supplied from GE generator driven by Cummins VT-12 diesel.

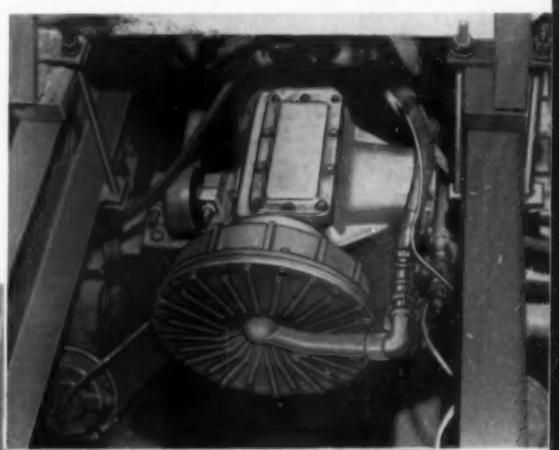
through action of fluid moving through a rotor and stator assembly.

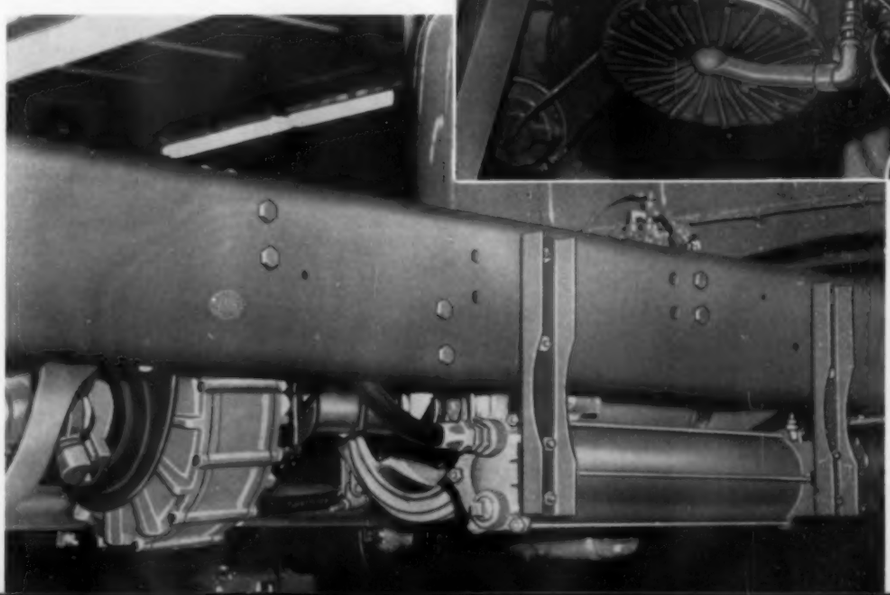
The rotor, which has a toroidal cross-section and series of radial fins, rapidly accelerates the fluid while at the same time redirecting it through its toroidal path. When it leaves the rotor the fluid is moving at maximum velocity. As the fluid enters the stator it "slows down" though redirection in the toroidal path continues. This redirection, slowing and speeding is the power absorption feature of the retarder.

When the fluid, a special petroleum-base hydraulic fluid, is transferred from rotor to stator, a portion of it is directed into a tangential passage where it leaves the rotor and passes through flexible tubing to the separately mounted Yates-American shell and tube, fixed bundle heat exchanger. The exchanger dissipates heat in the fluid into the cooling water from the radiator-connected system. Fluid leaving the exchanger re-enters the retarder unit.

The degree of retarding action is determined by the travel of the air loaded piston which in turn introduces the retarding fluid into the system. The amount of fluid in the retarder and speed of the rotor determine the braking force. Pressure of compressed air on one side of the piston and the retarding fluid on the other form a balancing force which maintains a given degree of retarding action. The loading cylinder also stores the fluid when retarding action is not required. Weight of the total installation is 214 lbs. for the mid-mounted unit and 176 lbs. for the axle-mount. The capacity of a particular installation is governed by the maximum pressure which is permitted in the vehicle's air system.

In a mid-mounted installation the retarder assembly is installed between the frame rails of the vehicle between the transmission and the rear axle. A drive line having a universal joint at each end is connected from the transmission to the retarder and another drive line, also with universal joints, is connected from retarder to rear axle. The axle-mounted unit is mounted directly onto the rear axle carrier but is adaptable only to carriers having through pinion shafts and a suitable mounting face to which the unit can be attached.





Axle-mounted retarder assembly, right, is fitted directly onto rear axle carrier. Mid-mounted unit, below, is fitted between transmission and rear axle. Loading cylinder, is connected to retarder assembly by means of Stratoflex hoses.

Exterior of the modern Kimball, Nebraska municipal power plant. Building was expanded when new Superior engines were installed to accommodate new switchgear.

PLANT'S SAVINGS AVERAGE $80,000 FOR SEVEN YEARS

Nebraska Community's Modern Power Plant Supplies Required Electricity at Average Cost of 6.2 Mills Per KW: Plant Has 5 Dual-Fuel Superior Engines, Including 2 Turbocharged 80-GDSX-8 Models

By DWIGHT P. ROBISON

DUAL-fuel operation and the building-block system of public power have paid big dividends to the city of Kimball, Nebraska . . . dividends averaging about $80,000 a year from 1952 to 1959. The city's modern, million dollar power plant is the sole source of power for a community of 5,000 in the southwestern part of the state and for the oil wells that helped bring real prosperity to Kimball, wells that now number 22 within the city limits alone.

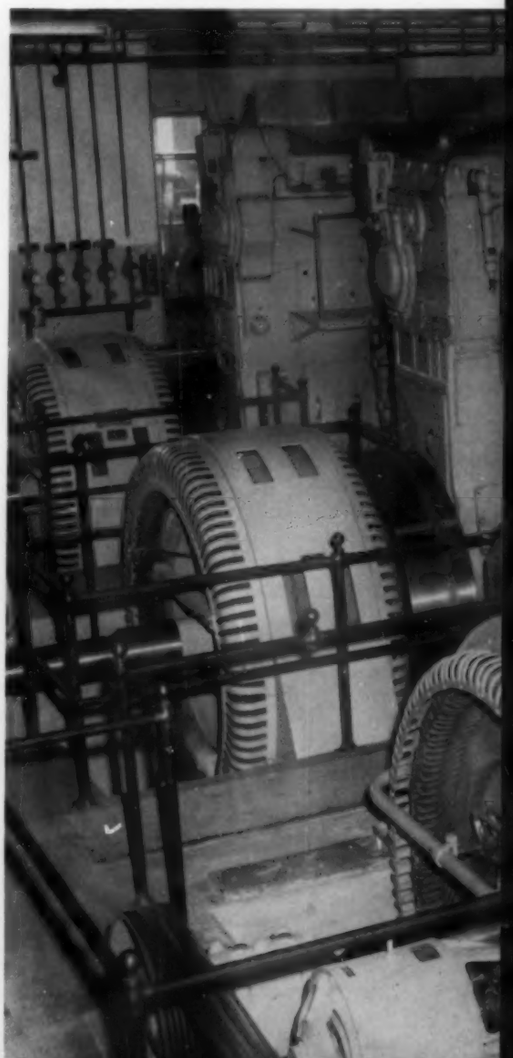
Private high-line utility rates for Kimball would average about 15 mills per kilowatt hour (kwh), but the home-owned plant has supplied all the required electricity at an average of 6.2 mills per kwh for the past three years, according to plant superintendent Ray Greenlee. When applied against last year's production figures of 11,748,900 kw, this represents a saving of slightly over $100,000! Savings such as this bear out the wisdom of Kimball's council in 1951, the year the city decided to expand its limited power facilities rather than buy from an outside source.

To supplement their 1,040 kw capacity, Kimball installed a 900 kw White Superior engine-generator set rated at 1,400 hp and designed for dual-fuel operation. Within four years the demand has risen so sharply that another White Superior was added, this one rated at 1,000 kw and also dual-fueled. A third Superior was added in 1956, bringing the plant's firm capacity up to 3,175 kw and providing what appeared to be a comfortable cushion against future expansion.

The peak load in 1956 was 1,850 kw. Since Kimball had not planned to meet this peak until 1965, it became obvious that the power schedule would have to be up-graded at a later date. In 1957 the peak became 2,150 kw; it jumped to 2,450 the following year, and in 1959 it stood at 2,700. The cushion was no longer comfortable.

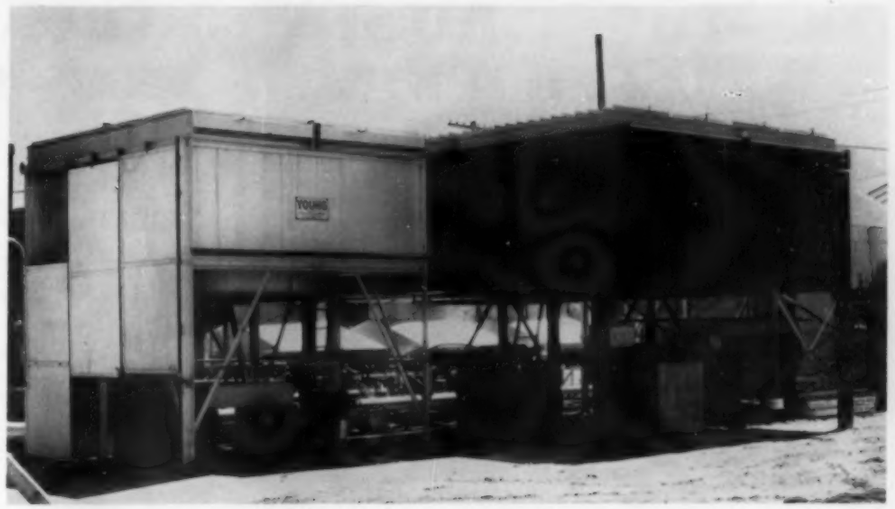
Negotiations were therefore re-opened last year to add some power padding. They concluded with the purchase of a pair of 1,250 kw units, and again the order went to White. Before the engines could be installed, there had to be some juggling of space to accommodate the new power units. This was resolved by adding a 28 ft. by 42 ft. bay to the present building. New General Electric console-type switchgear was placed in the bay, and one of the three vintage engines was removed, so the recently-purchased engines moved into the spots formerly occupied by the old engine and switch-gear.

First of the new Superior turbocharged 80-GDSX-8's was placed on the line in January, and the second was just put into service at the end of April. The firm capacity of the plant is now 4450 kw from the five Superiors and one Alco engine. The Superior 80-GDSX-8 is a turbocharged, eight cylinder, four stroke engine with bore and stroke of 14½ x 20 in. The engine is rated 1770 hp at 360 rpm and drives an Elliott generator rated 1250 kw, 1563 kva, at 360 rpm.



Interior view of Kimball power plant showing two new Superior turbocharged 80-GDSX-8 engines. The power set at right was the last 1,250 KW unit to be put on the line, bringing the plant's firm capacity up to 4,450 KW as of May 1, 1960. Engine in center went on the line in January.

Rear of Kimball power plant showing Young radiators for engine cooling system.



The ability to add new power units when more power is needed is the main point of a building-block system, and Kimball provides an excellent example. Even with amortization of the engine prices included, the kwh cost is still less than half of the private utility rate. Another advantage to the system is that the six generators offer combinations of output to match the exact requirements at any time—night or day, Monday through Sunday. There is no wasted horsepower and no untimely kilowatt drain. And, of course, locally-generated power is easier to control in case of emergency.

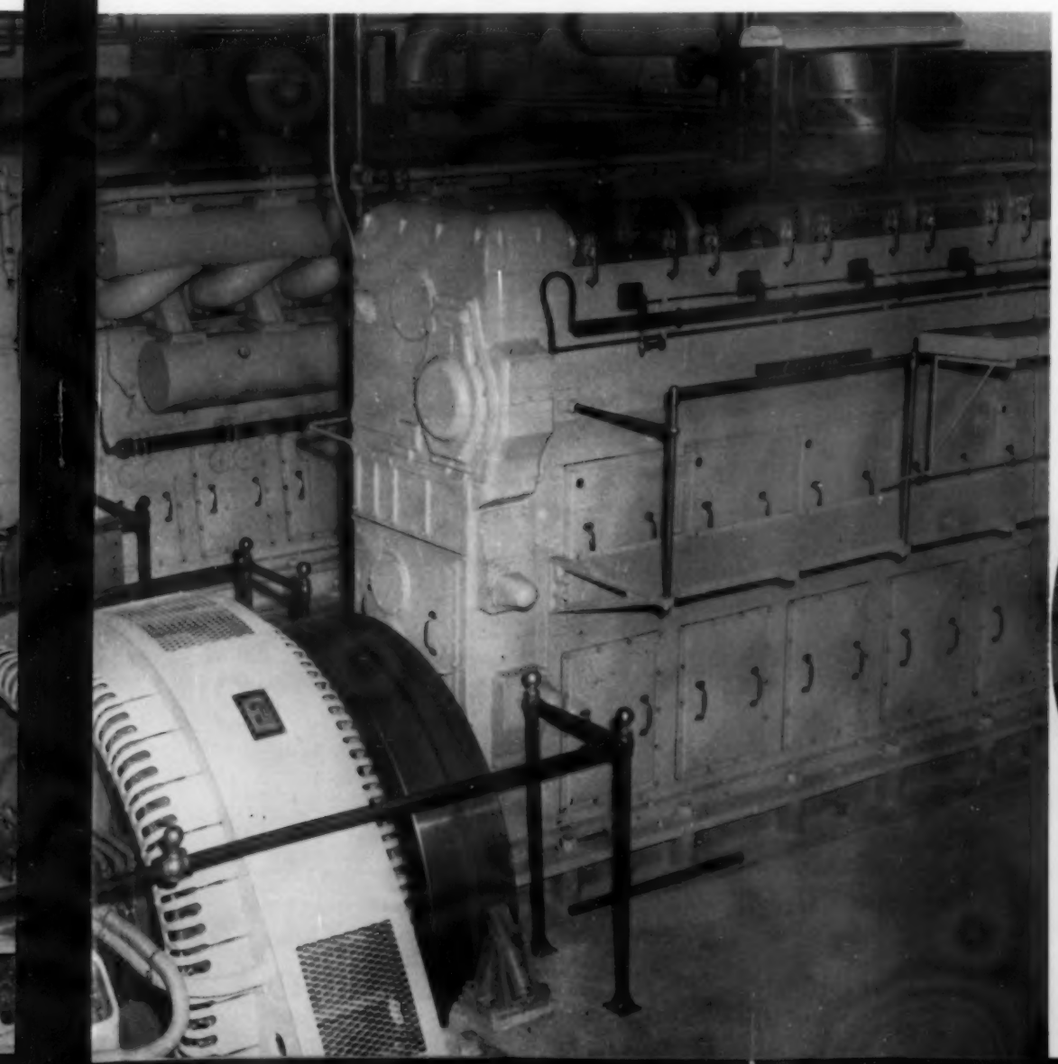
As for dual-fuel operation, the switch from full diesel to take advantage of the area's natural gas resources has brought further economies to Kimball. At 13 kw per gallon, 903,762 gals. of diesel fuel would have been required to achieve the 1959 production. The cost would have been $103,932. The actual cost for 87,530 gallons of fuel and 120,916 mcf of natural gas last year was $44,359, so here is another saving of $60,000.

The three Superior engines purchased before 1957 have performed faithfully. For the past three years the two 1,000 kw units have each averaged almost 36,000 hp hrs./gal. of lube oil; a high of 43,400 was recorded on the No. 3 engine in 1958. The yearly maintenance and repair costs have averaged less than $250 per engine for three years. During this period, No. 2 and No. 3 engines have been performing 72 per cent continuous duty.

The 80-GDSX-8's at Kimball are equipped with Elliott turbochargers, generators and exciters, Woodward governors, Young radiators and intercoolers and Bendix-Scintilla fuel injection equipment. Other items of accessory equipment were supplied by the contractor, B. C. Bunn of Clarion, Iowa, with the recommendation and approval of the White Diesel Engine Division.

Principal Equipment Serving Superior 80-GDSX-8 Engine

Generators	Elliott
Governor	Woodward
Compressor	Ingersoll-Rand
Fuel injection pumps	Scintilla
Fuel oil filter	Purolator
Lube oil filter	Hilco
Lube oil strainer	Air-Maze
Intercooler, heat exchanger	Young
Thermostatic controls	Amot
Air intake filter	Air-Maze
Exhaust muffler	Maxim
Exhaust pyrometer	Alnor



Four Kimball officials visited the White diesel plant in Springfield to look over the two Superior 80-GDSX-8's destined for their city's power plant. They are (left to right): Jack Fiscus, councilman; James Bourret, mayor; Ray Greenlee, superintendent of the power plant; and Marvin Knutsen, councilman.

LARGE DIESEL TOWBOATS MARK EFFICIENCY OF FBL'S SERVICE

St. Louis-Based Water Carrier Pioneered Construction of Large, Dieselized Towboats to Improve Operating Economy; Many Design Innovations Incorporated In the Firm's Extensive Fleet

By LOUIS M. REITZ

ON the river you can hear the towboat pilots making passing arrangements over the radio saying such things as, "I'm over here in the black," or ". . . the red." This means that he is proceeding along the right bank—facing down stream (black buoys), or the left bank (red buoys). Depending on several factors such as "set" of current, width of channel, and size of tow, he will be equally safe —black or red. But it's a different story with the IBM pilots in the front office. They've *got* to stay in the black, and operating companies are quick to latch on to anything that will help them to do so.

Let's see how Federal Barge Lines, one of the oldest on the river handles the problem. Founded by the United States Government in 1918 to help relieve a critical World War I transportation shortage, FBL was continued in operation after the war as a pioneer to revive low-cost freight transportation then all but dead on the "river". In the years that followed this outfit opened up barge traffic on the Western Rivers (Mississippi System). In 1924 an Act of Congress provided that FBL continue to operate under the Government until these waterways had been made commercially navigable, adequate terminal facilities established, and privately owned barge lines set up to compete for traffic. By 1953 more than 935 privately owned carriers were operating on the Mississippi River System. In that year Herman T. Pott of St. Louis, Mo., bought the line, retaining key personnel together with the familiar name and the lemon yellow, grey and black "house colors".

Service area of Federal Barge Lines, including connecting services.

At that time the company consisted of 20 towboats, 13 of which were steam, and 272 barges. Since steam failed to fill the bill for profitable operation, FBL under the leadership of board chairman H. T. Pott and Capt. A. C. Ingersoll Jr., president, drew up specifications for a new concept in towboats and submitted them to the engineers at "St. Louis Ship". The result was the first "four wheel" towboat on the river. This boat of many firsts was the well known *Lachlan MacLeay* powered by four General Motors 12-567A diesels for a total of 3600 hp. She "came out" in 1955 and was specifically designed to operate on the "Wild Missouri" with its 6 to 7 ft. channel. (A bottleneck in a system of 9 foot waterways). Applying the desired power to the water, with this shallow draft vessel was quite a problem. The channel of the Missouri River meant that the new boat's wheels could be no more than 6½ ft. in diameter. This was allowing for the extra foot in wheel's diameter that rides up in the contour in the under-side of after end of hull. This is the "tunnel" that gives the boat the designation "tunnel stern" or "tunnel drive". As this cavity extends above waterline it is normally empty but as soon as the wheel begins to roll it is pumped full of water, allowing the extra foot in wheel's diameter. Since two or even three wheels of this diameter would not handle the planned power it was decided to use four wheels. Getting water to the inboard wheels when the boat would be sliding her bottom over the "lumps" in the shoal spots, called for some careful designing of the knuckles and the after end contours. Test tank trials made here and in Holland arrived at the desired design. Among other innovations on this boat was the use of residual fuel. This also led the

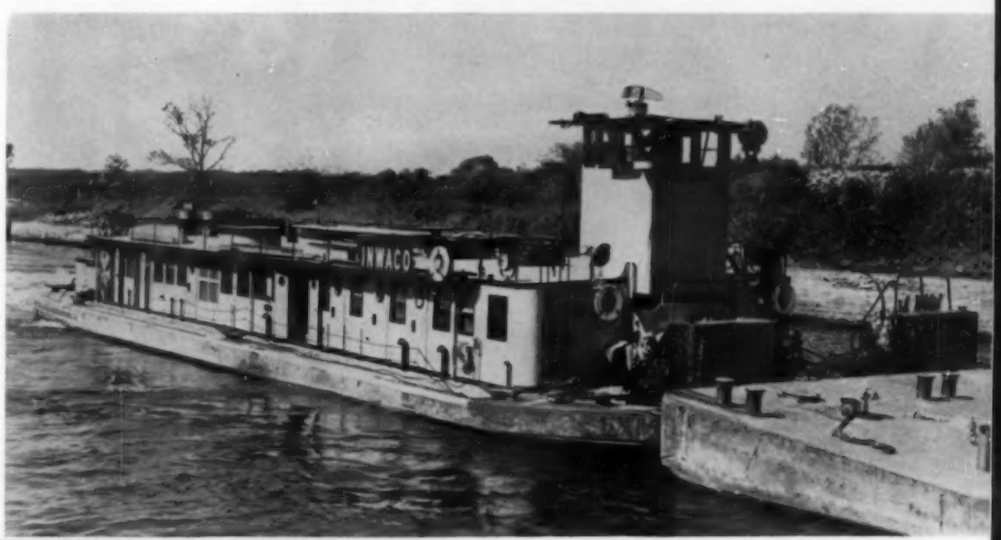
"Fish's-eye view" of the stern of the *Lachlan MacLeay* showing placement of six flanking rudders ahead of the wheels and four steering rudders directly in line with the shafts.

company into use of the Vapor Phase systems built by Engineering Controls of St. Louis, Mo. This system makes it possible to run the engines hot enough to keep the heavy fuel flowing well through the engine fuel system and give good atomizing performance in fuel injectors. This high temperature level also helps to prevent formation of corrosive compounds due to water condensation in the engine cylinders.

The *MacLeay* proved out so well that the company decided to build another wide beamed four wheel boat. In 1956 they "brought out" the *Missouri*, a sister vessel also propelled by four GM 567A engines totalling 3600 hp. This boat was also equipped to burn heavy fuel in all four engines and had the Vapor Phase system. The *Missouri* was further refined by having her four wheels shielded by venturi-like shrouds which combined the best features of the Kort nozzle improved with an airfoil type contour engineering by St. Louis Ship. Of course the familiar "forward look" of this vessel makes the twins show little outward resemblence to each other despite their being cast in the same mold. Though being designed for use on the shallow Missouri river, she gave such satisfactory service on the Mississippi, as well, when the time come to build a more powerful boat for use on the lower Mississippi, her best points were incorporated into the big new *United States*. This giant of rivers was powered by four Cooper-Bessemer diesels rated 2125 hp at 327 rpm and was fully described in the Jan. 1959 issue of DIESEL AND GAS ENGINE PROGRESS. This claim will no longer be true however when the new FBL boat, the *America*, comes off the ways at St. Louis Ship, later this year. *America* will be four ft. longer and have 9000 hp in Cooper-Bessemer diesels instead of the 8500 hp of the *United States*. When the new boat comes out Federal will have 13 towboats totalling 43,540 hp to handle a fleet of some 260 barges with a total capacity of 365,818 tons.

The recent acquisition of the Gulf Canal Lines extends the operation over some 5300 miles of rivers, canals and coastal waterways; offering one of the most extensive common carrier barge services in the United States, reaching from Chicago, Minneapolis and Sioux City through New Orleans to Brownsville on the one side and around the Gulf

View of the engine room of the *M/V United States*, showing the four Cooper-Bessemer diesels rated 2125 hp each at 327 rpm. Engines are installed to burn heavy fuel and vessel is equipped with Vapor Phase system.



The *Inwaco*, one of FBL's smaller towboats for service on the upper Mississippi and Illinois rivers, is powered by two Nordberg direct reversing 900 hp diesels.

The *Lachlan MacLeay* was built in 1955 and is powered by four GM 12-567A engines with a total of 3600 hp.

M/V's currently in FEDERAL BARGE LINE'S fleet.

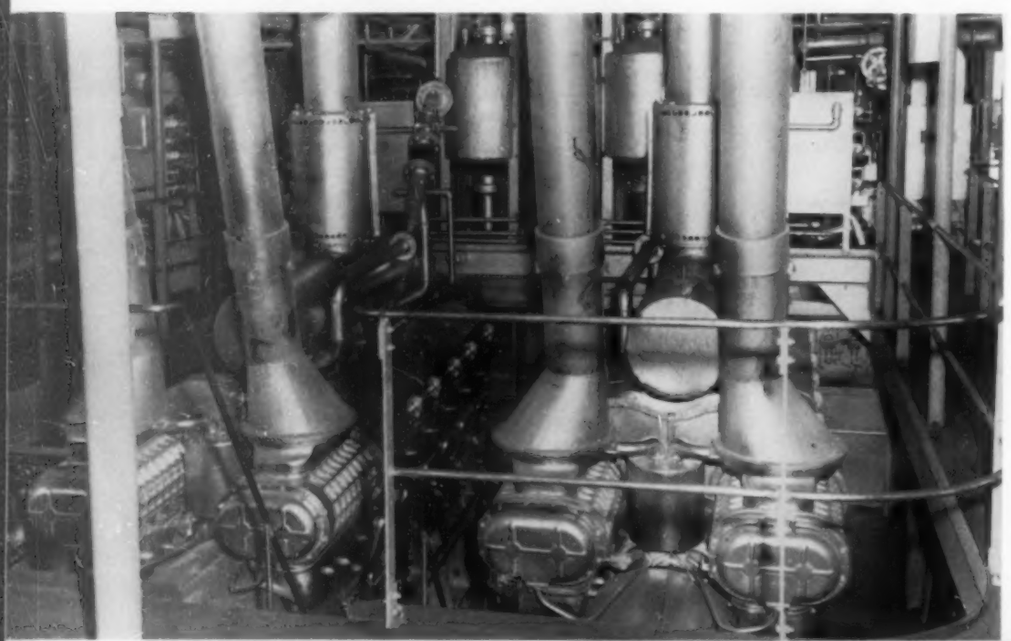
Vessel	Size	Engine make & model	Number of wheels (engines)	Total HP
United States	180'x58'x12½"	Cooper Bessmer LS8Dkt	(4)	8500
Missouri	162'x45'x10'	GM 12-567A	(4)	3600
Lachlan Macleay	162'x45'x10'	GM 12-567A	(4)	3600
Mark Eastin*	177'x42'x11'	GM 498	(2)	5600
Harry Truman	100'x54'x11'	GM 16-278A	(2)	3200
Tom Sawyer (S)	148'x40'x8'	GM 16-258S	(2)	2200
Minnesota (S)	149'x40'x8'	GM 12-278A	(2)	2400
Helena (S)	160'x40'x8'	GM 12-567A	(2)	1800
Inwaco	112'x35'x8'	FED 13E H&C Nordberg	(2)	1800
David C. Bintliff (G)	72'x23'x8'6"	Superior 40M5X-S	(2)	1080
Rudolf Smutny (G)	72'x23'x8'6"	Superior 40M5A-S	(2)	1080
Chas. C. Bintliff (G)	72'x23'x8'6"	Superior 40M5X-S	(2)	1080
Point Comfort (G)	132'x23'x10'6"	GM 567	(2)	1800

* chartered (G) Gulf Canal Lines. (S) converted from steam.

with her pair of 12 cylinder GM 278A diesels each rated 1200 hp and the shallow draught *Helena*, powered by two GM 12-567A diesels each of which are rated at 900 hp.

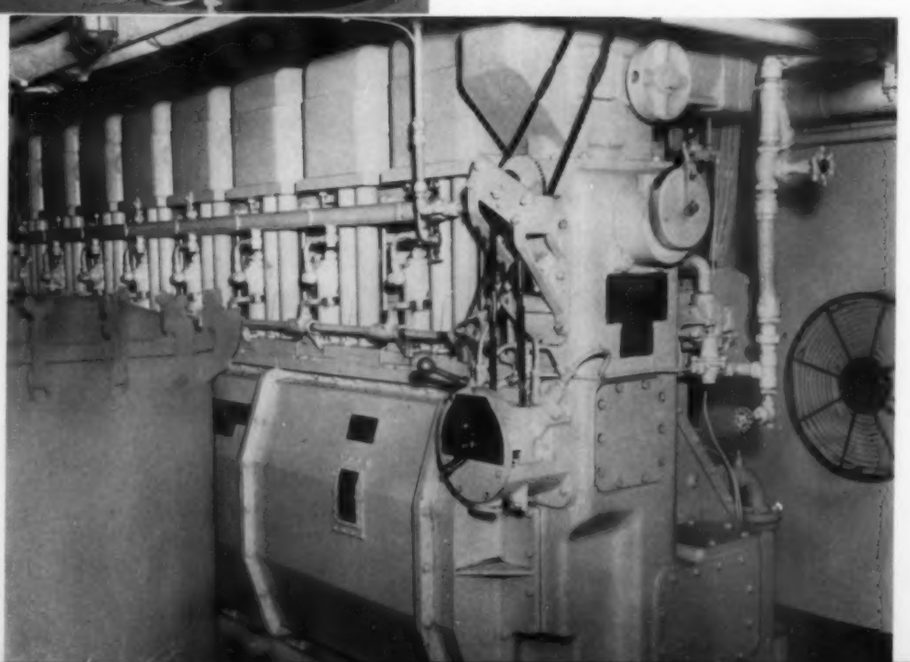
Federal Barge Line's headquarters are in a new building at 611 East Marceau Street in South St. Louis, Mo. Here also is the dispatching room that maintains radio contact with the entire fleet of towboats, as well as the "boards" that show the exact location of every piece of the company's floating equipment. A shipper can readily be kept informed as to the present whereabouts and E. T. A. of his shipments and the availability of empties when needed. The company's boats are of course all equipped with the latest in navigation aids (radar, radio phone, sounding equipment, etc.) and safety gear as well as every provision for the comfort of the crews. Regional offices are at Chicago, Houston, Kansas City, Memphis, Minneapolis, Mobile, New Orleans, New York, Omaha and Birmingham.

When the time comes to install the necessary gear that will make it possible to automatically navigate a good part of the river with a more nearly "straight rudder" these bigger more powerful diesel boats will be "just the ticket" intimated Capt. Ingersoll. "If it is possible to land a jet plane going several hundred miles per hour, and control it up and down as well as sideways, it should be feasible to steer a tow with a minumum of correcting with the rudders." Mark Twain observed over 100 years ago that, "no speed records were ever broken by a boat that was dragging her rudders across her wake." And it's as true today.



Engine room view of the *M/V Missouri* showing two of the four GM 12-567A engines. Vapor Phase steam separators are visible atop engine vee.

One of two Norberg direct-reversing, 900 hp Supairthermal engines which power the *Inwaco*.



to Fort Myers and all points between—with connecting services reaching the entire Ohio river system (see map above).

The deeper shade of black in the Company's ledgers is graphic proof of the superiority of diesels as profit-producing prime movers, and that a great many more ton miles can be logged with fewer vessels, each of greater individual power. In '59 the Mississippi Division alone logged 2,571,864,000 ton miles. Some of the older boats, still in use, were steamers that have been converted to diesel, and FBL has also built two smaller towboats for operation on the upper Mississippi and Illinois rivers. One of these is the M/V *Inwaco* with two direct reversing 900 hp. Norberg Supairthermal diesels. Two conversions are the M/V *Minnesota*

CAT BOOSTS RATINGS FOR 3 GAS UNITS

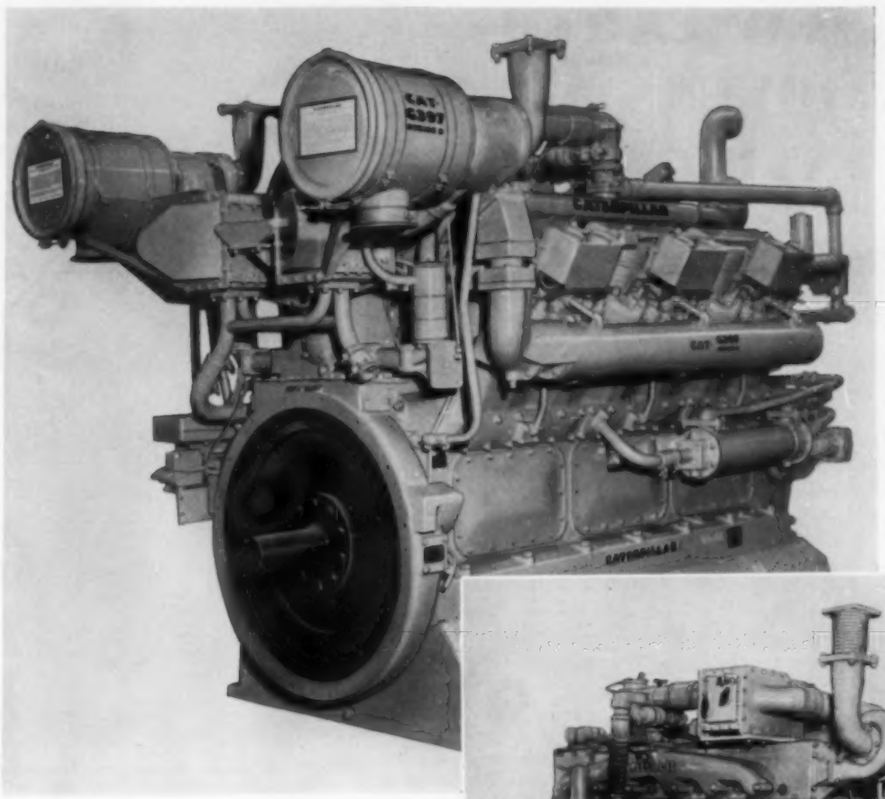
INCREASED horsepower ratings for Caterpillar's line of spark-ignited gas engines have been announced by the firm's Engine Division. The increased output is possible through turbocharging and aftercooling of these engines, raising horsepower as much as 90 on the G397 to a continuous rating of 560 hp at 1300 rpm. The turbocharged and aftercooled engines in the G375 and G342 sizes are 380 hp and 280 hp respectively for continuous operations, compared with 310 hp and 235 hp in their naturally aspirated versions.

The Cat gas engines have found applications in oil fields for drilling, compressor drives and pumping, in irrigation for pumping, and in industrial plants and commercial buildings for electric power generating. Fred V. Jacobs, Engine Division sales manager, reported that the G342 had shown a fuel consumption figure of only 7200 Btu/bhp/hr. (low heat value) and said, "laboratory tests show that turbocharging and aftercooling these units gives appreciable horsepower gain. Fuel consumption is comparable to the naturally aspirated engines."

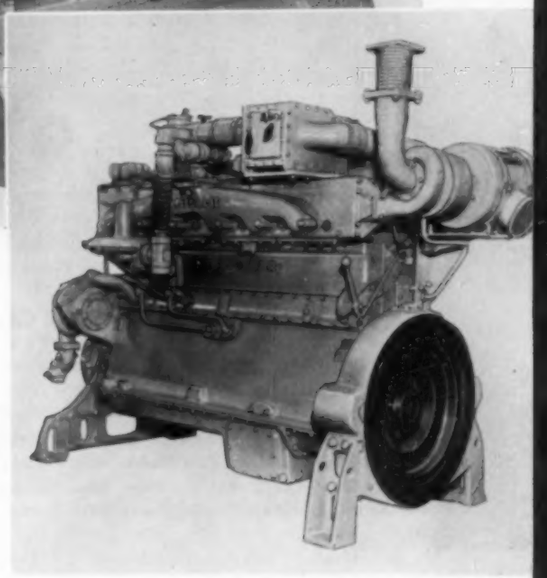
On the six cylinder G342, the turbocharger is mounted at the rear of the engine and the aftercooler is mounted atop the exhaust manifold, at about the point where the air cleaner is installed on the naturally aspirated model. Fittings for aftercooler cooling water feed and exhaust are on the same side of the aftercooler.

Twin turbochargers are used on the G375 and G397 and each of these serves one bank of cylinders on the Vee-type engines through separate aftercoolers. The air cleaners and turbochargers are mounted at the rear of the engine and their companion aftercoolers are mounted between the turbochargers and the inlet manifolds. Adding these units does not appreciably change the height or width compared with the naturally aspirated versions of these engines.

Except for addition of the turbochargers and aftercoolers, the engines in all three models are identical to their naturally aspirated counterparts. The G397 is a Vee type engine, 12 cylinder with bore and stroke of 5¾ x 8 in. and piston displacement of 2493 cu. in. The G375 is similar in appearance but has eight cylinders instead of 12, with piston displacement of 1662 cu. in. The G342 is a six cylinder, in-line engine also with 5¾ x 8 in. bore and stroke and it displaces 1246 cu. in.



Cat G397 gas engine showing mounting of turbochargers and aftercoolers. With these features this 12 cylinder, Vee-type engine is rated 560 hp at 1300 rpm.



Cat G342 gas engine, turbocharged and aftercooled. This engine is rated 280 hp at 1300 rpm.

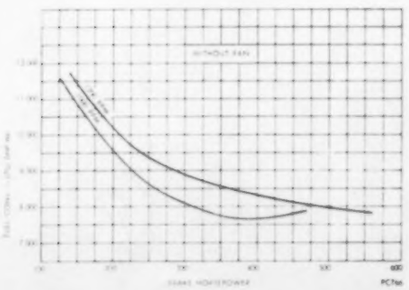
Ratings of electric sets with the turbocharged aftercooled engines have been increased in proportion to the higher horsepower rating.

A set with a G397, turbocharged and aftercooled, has been hiked from 275 to 375 kw. With the G375 the rating is increased from 175 to 250 kw while the higher output version of the G342 is rated 175 kw, well above the 125 kw rating for the naturally aspirated models. All the above ratings are determined at a speed of 1200 rpm.

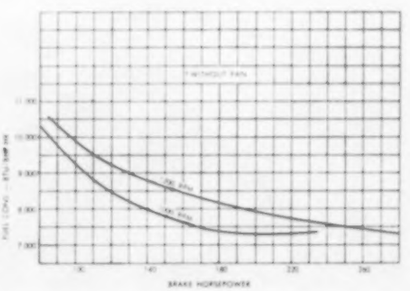
Although the Cat gas engines are available with either 10.5:1 or 7.5:1 compression ratios, the turbocharging-aftercooling feature is available now only on engines with the 10.5:1 ratio. Engines with 10.5:1 ratio use methane gas such as natural gas and sewage gas with high heat value not greater than 1150 Btu/cu. ft. In naturally aspirated engines with 10.5:1 compression ratio propane may also be used as long as it does not contain butane in quantities above the maximum allowable for commercial grade propane.

All three engine models use Cat's low tension ignition system and heavy-duty industrial type carburetors. The engines are adaptable for 10.5:1 or 7.5:1 compression ratios by changing pistons and can also be converted to straight diesel operation with diesel oil by changing a minimum number of major engine parts.

Fuel curve, Cat G397, turbocharged and aftercooled.



Fuel curve, Cat G342, turbocharged and aftercooled.



NEW EARTH-MOVERS ARE INTRODUCED

THREE new diesel earthmoving machines have been introduced by the Allis-Chalmers Co., in recent months. Included are a new TS-360 motor scraper, a TR-160 rear dump motor wagon and a TL-12 front-end wheel loader.

The TS-360, largest of the new units, was introduced at "premieres" for contractors held recently in California and Florida. The TS-360 is an all-hydraulic scraper with 30 cu. yd. heaped capacity and 22.3 yd. struck capacity. It is powered by an Allis-Chalmers model 21000 diesel engine rated 340 bhp at 2100 rpm. This engine is a turbo-charged, four cylinder model with bore and stroke of 5¼ x 6½ in. It drives through a Lipe-Rollway 17 in. dry type double plate clutch and a Fuller five speed, constant mesh transmission with spur gear and inertia brake.

The unit has Allis-Chalmers' Kon-Tork differential which automatically controls distribution of torque to the drive wheels to give maximum traction to match working conditions. Maximum speed is 26.3 mph; empty weight is 63,150 lbs. The TS-360's turning radius is 35 ft. 8 in.

The TR-160 rear dump motor wagon has a carrying capacity of 12 tons—7.7 cu. yds. struck and 12 cu. yds. heaped. The unit is powered by Allis-Chalmers' TDS-516 four cylinder, supercharged diesel engine rated 155 hp at 2200 rpm. The engine drives the wagon at a 25.4 mph maximum speed through a 13 in. dry type, double plate Spicer clutch and a Fuller five speed constant mesh transmission.

The TR-160 is also equipped with Kon-Tork differential. The 7 ft. 11 in. unit can make a non-stop 180 degree turn in 22 ft. 8 in., with a 1/6 turn of the steering wheel. Hydraulic power for steering and loading is supplied by a tandem pump which is gear-driven from the rear of the engine crankshaft. The wagon body has a load area of 11 ft. x 7 ft. 10 in., and provides a big target for shovel and dragline loading. When fully loaded there is over 26 in. of clearance under the wagon axle. To permit greater use value, the rear dump wagon is interchangeable with the 7 cu. yd. S-160 scraper.

TS-360 scraper during premiere demonstration in Florida. Unit has A-C's 21000 diesel engine rated 340 hp at 2100 rpm; drives through Lipe-Rollway 17 in. dry type double plate clutch and Fuller 5-speed transmission.

The model TL-12 front end loader is a four-wheel drive unit with a carrying capacity of 4,000 lbs. and static lifting capacity of 9,500 lbs. The diesel version of the TL-12 is powered by an Allis-Chalmers ACD-262 engine rated 76.5 hp at 2200 rpm. The engine drives through a Twin Disc 13 in., 3.1:1 torque converter and Twin Disc hydraulically engaged multiple disc, dry type clutches, one for forward travel, the other for reverse. Transmission is Allis-Chalmers' Tractomatic, a four speed, power reversing unit. The transmission is geared for forward speeds up to 21.2 mph and reverse speeds to 27.9 mph. The Tractomatic transmission, operated from a lever on the steering column, controls both forward and reverse without stopping to clutch and shift gears.

Four buckets are available, ranging from 1 to 2 cu. yd. capacities. Bucket tip-back at carrying height is 47 degrees; there is up to 14,500 lbs. of breakout force at the cutting edge. The hydraulic system is fully enclosed and hydraulic oil is triple filtered. Power boosted, four wheel hydraulic brakes are standard equipment on the loader.

New TR-160 rear dump motor wagon has Allis-Chalmers TDS-516 supercharged, four cylinder, 155 hp diesel engine, 13 in. dry type clutch and 5-speed Fuller transmission.

New Allis-Chalmers TL-12 front end loader is powered by firm's model ACD-262 diesel engine rated 76.5 hp at 2200 rpm driving through Twin Disc 13 in. torque converter and multiple clutches.

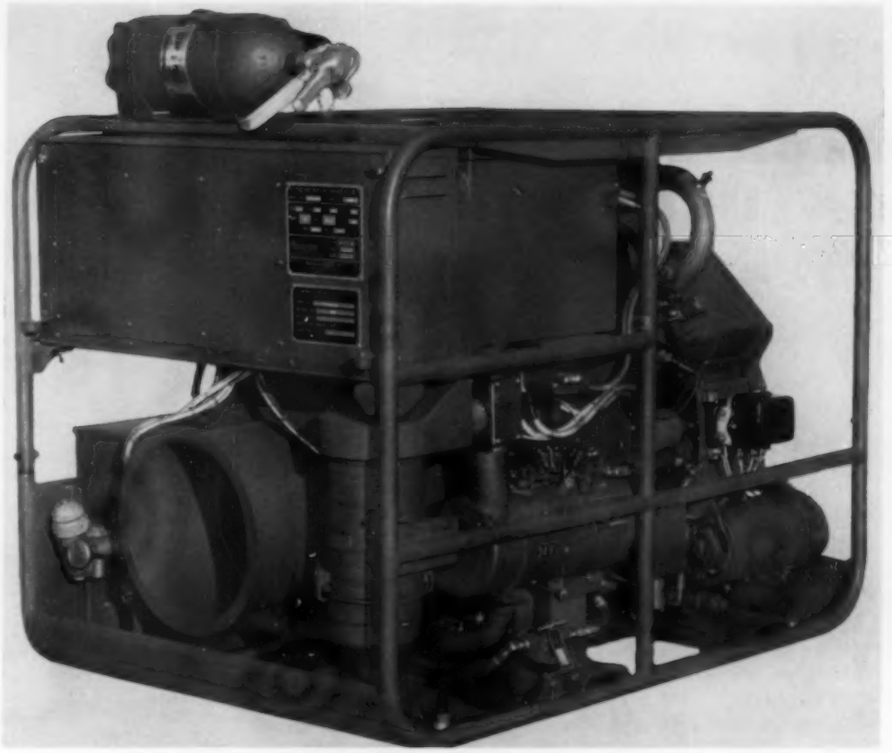
MULTIFUEL PREHEATERS FOR DIESELS

A NEW engine preheater, which burns the same fuel as that used in the engine, is being marketed for installation on engines that must be started and operated at low temperature. The Benmar Co., of Cleveland, Ohio, has set up a heater division to produce the liquid fuel burning units presently being used as engine preheaters by the government on diesel electric power plants. General Manager William S. Beckenbach said the heaters are being built under license by R. J. Brown, Benmar chief engineer and inventor of the line of engine heaters.

In the Benmar heater, a new concept in prevaporization of the fuel through use of a properly designed highly porous ceramic, plus use of a concentrated, high-intensity heat for ignition makes it possible to burn a variety of fuels. Other problems such as removal of wax precipitates and metering of various fuels at different temperatures and different viscosities also had to be solved and the findings incorporated into the design.

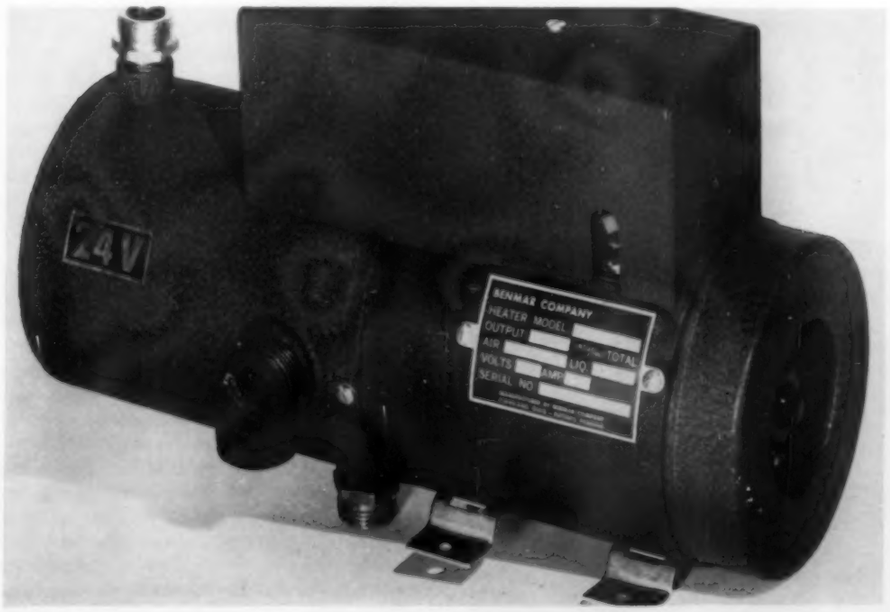
Preheating of diesel equipment using diesel fuel is a prime need of the armed forces. Lack of a heater that burned the same fuel as the prime mover presented a logistics problem in providing a separate fuel and fuel tanks on each piece of equipment. The U. S. Army Corps of Engineers tested the Benmar heater last November at their Ft. Belvoir, Va., Arctic laboratory, using JP4 jet fuel, VVF800 DFA diesel fuel and gasoline, in connection with their diesel generator and gas turbine generator development programs.

In a typical application as illustrated in figure 1, air passing through the heater is boosted to approximately 200 degrees F. and then introduced into the engine crankcase where it heats the crankshaft, connecting rods, pistons and entire engine block. Hot fresh air is also sent into an isolated battery container to preheat the battery. Heater exhaust gases are utilized to heat oil in the sump by use of a heat exchanger. When cranking the engine prior to a cold start, heated fresh air is introduced into the intake manifold through a thermostatically controlled valve in the air cleaner. Controls are used to automatically turn the heater on and off to maintain the equipment for immediate starts even at −65 degrees.



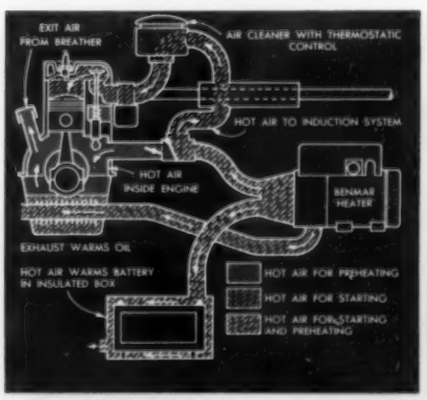
Benmar AP1530 heater installed on an American Marc 7.5 kw precise power air cooled diesel generator set. The set is used primarily as a power supply for Signal Corps communications equipment. They also supply power for electric space heaters used in mobile units.

At present, Benmar is making three models of the preheater line. The model AP1530 is a 15,000 Btu/hr. heater, measuring 10⅜ in. long, 8⅜ in. high and 5¼ in. wide. Weighing 9½ lbs., this model was designed primarily as a preheater for small and medium sized liquid and air cooled engines. The model AP2030 is a slightly larger version and produces approx. 20,000 Btu/hr. The model CP1530 is a coolant type engine block heater which uses the same multi-fuel burner. This model, used with a coolant circulating pump, produces about 20,000 Btu/hr. The heaters operate on 12 and 24 volt dc current.



Model CP1530 coolant heater. This unit is similar to other models in the Benmar line but is used to preheat engine coolant which is piped through heater fittings on top and bottom.

Typical application arrangement of Benmar fresh air heater.


EXIT AIR FROM BREATHER
AIR CLEANER WITH THERMOSTATIC CONTROL
HOT AIR TO INDUCTION SYSTEM
HOT AIR INSIDE ENGINE
BENMAR HEATER
EXHAUST WARMS OIL
HOT AIR WARMS BATTERY IN INSULATED BOX
HOT AIR FOR PREHEATING
HOT AIR FOR STARTING
HOT AIR FOR STARTING AND PREHEATING

FLORIDA ARK GATHERS SEA SPECIMENS

By ED DENNIS

THE place is Miami, Fla., the vessel, the *Seaquarium,* one of the world's most unique vessels, recently launched and put into use. The reason . . it is rigged for catching monster sharks *alive;* from small 50 pounders to whopping big thousand pound tiger sharks, from the blue tropical waters off the Florida coast.

Christened the *Seaquarium,* this 72 ft. dieselized craft was built by Dupont Inc. of Patterson, La. It has a beam of 19 ft. 3 in. and a draft of four ft. The vessel, of welded all steel construction, is the only one if its kind in the world and will be used for collecting live marine specimens of every size and variety for exhibit in the huge giant steel exhibition tanks of the Miami Seaquarium, which houses one of the largest collections of rare and colorful sea creatures in the world.

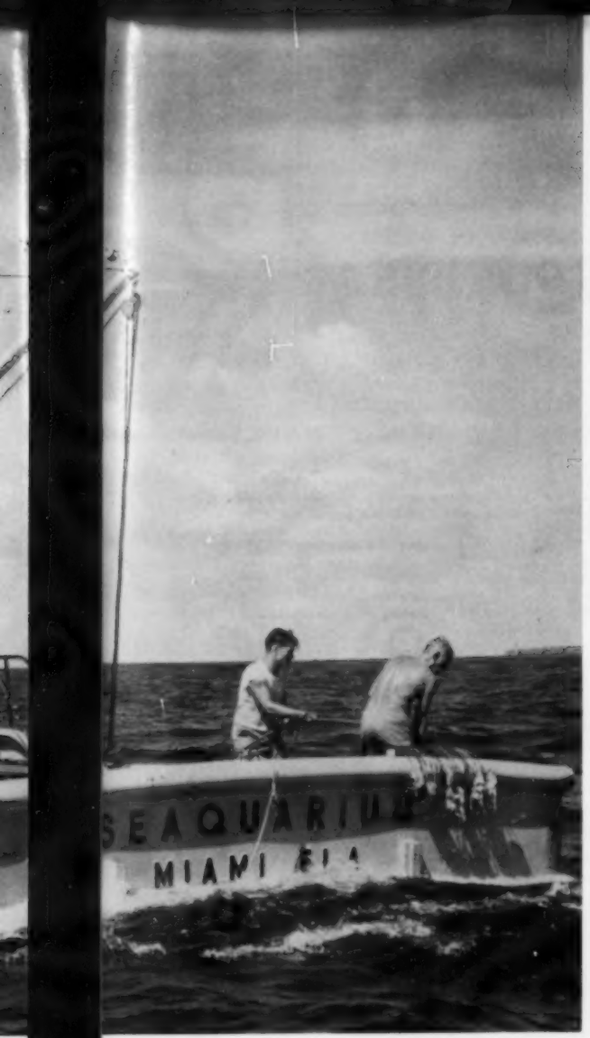
The *Seaquarium,* built at a cost of approximately $200,000., is powered by two General Motors 6-110 two cycle 6 cylinder diesel engines each with a total displacement of 660 cu. in. At 1800 rpm they have a total continuous shaft hp of 440. The diesels are equipped with Allison Torqmatic marine 2:1 hydraulic r&r gears. With a cruising speed of 17 mph and a fuel capacity of 2800 gal., the vessel, has a cruising range of approximately 2500 mi. This will enable the *Seaquarium's* crack fishing team to range far and wide in search for marine specimens they have not been able to capture before in their old craft.

The main entrance to the 2½ million dollar Florida show place. It houses one of the world's largest and most complete line of marine speciments.

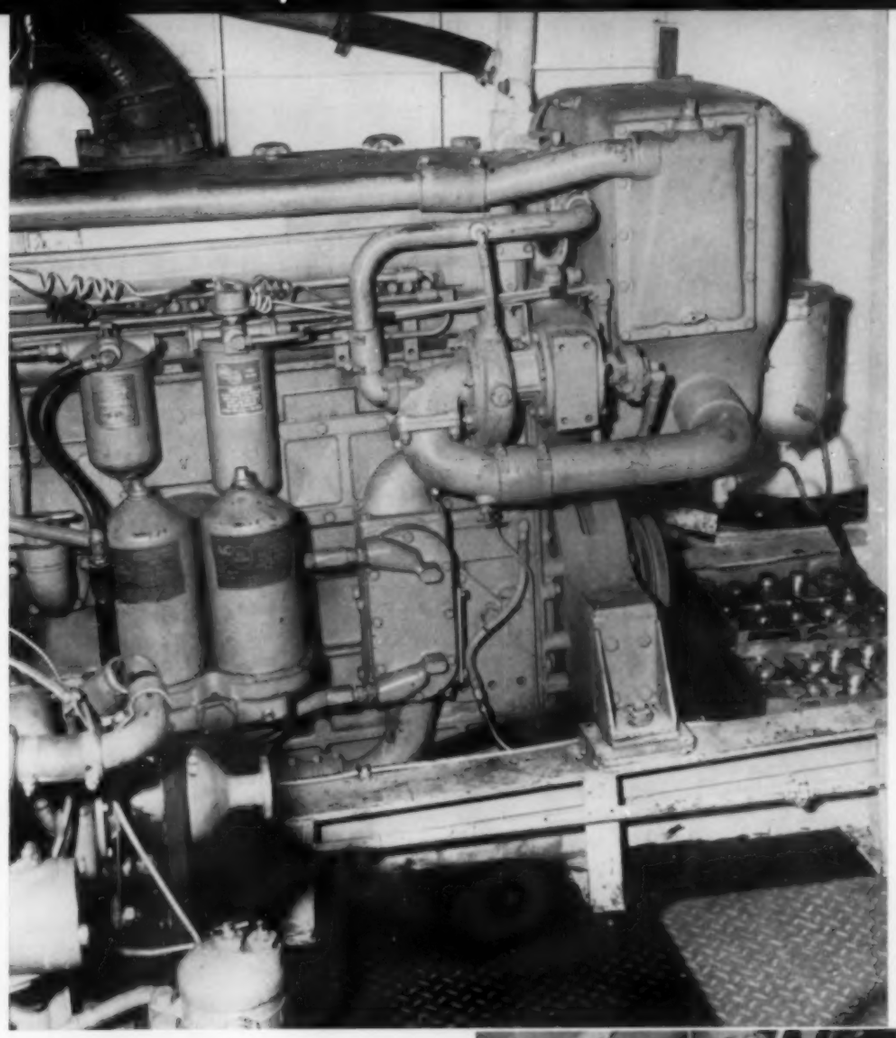
The main engines also have CFC Fulflo fuel strainers and AC fuel and lubricating oil filters along with a Perry, model 65, cooling system conditioner. Also in the engine room are two model OM636 Mercedes-Benz diesel engines each driving a 7.5 kw, 26 amp, 120 volt Onan generator. The switchboard was constructed by McIntosh Marine Service. Gulf HD#30 lubricating oil is used.

The most unusual feature of the *Seaquarium* is the door in the stern through which the "sea passengers" can swim right into the live well. This includes anything and everything from an inch long jewel fish to 20 ft. whales which can be taken aboard and retained in excellent condition. This live well measures 21 ft. in length, 3 ft. deep, 8 ft. wide and holds 3250 gal. of sea water. It has a watertight door in the stern transom which opens vertically allowing the aquatic passengers such as porpoises and sharks etc. to swim right in.

Chief collector for the Seaquarium is Capt. Bill



The 72 ft. by 19 ft. *Seaquarium* in Biscayne Bay, Miami. This craft is powered by two diesels with a cont. hp of 220 each. Its cruising range is 2500 mi. It was constructed by Du-Pont Inc. of Patterson, La.



One of the General Motors 6-110 diesel engines rated 220 hp at 1800 rpm. It drives a 28x26 propeller through Allison Torqmatic 2:1 hydraulic r&r gears for a cruising speed of 17 mph. Also shown is the Perry model 65 cooling system conditioner.

Gray, a veteran of more than 50 years on the briny deep, who has trained this crew of seagoing big game hunters well. They are a group of calm and nerveless men especially when they are around such fearsome creatures as the sharks they catch. The blue tropical waters are full of them and the men hunt these sea creatures with a passion few men can quite understand. According to ichthyologists there are more than 200 species of sharks. Many are found in the waters in which the *Seaquarium* operates. They include species such as the tiger, nurse and the mako, reputedly one of the most deadly sharks. The mean little lemon shark and the ugly hammerhead are also targets for Capt. Gray's *Seaquarium* crew.

Work for this new dieselized craft is not confined only to collecting live marine specimens for this $2½ million Florida show place but also for scientific medical research work. This scientific group is also contributing their share toward a cure for cancer as they collect certain marine specimens for the Cancer Institute as well as for colleges and universities. They just recently shipped a sharks head to the University of Chicago for research work. Sea horses are another form of marine life collected for medical research work as they are one of the few species that have kidneys.

Designed to fill its unique role as a veritable *Noah's Ark* of the deep sea, nothing was left out towards making first class accommodations for the crew and passengers. The mahogany fitted cabins will accommodate a crew of six in two cabins along with a shower and head plus a galley and dining salon. Since the craft has ample electrical power provided by two 7.5 kw Mercedes-Benz generating sets, air conditioning will be installed in the near future. Navagational aids on the open flying bridge include automatic pilot, compass and radio telephone. Now the men who make a business of capturing sea creatures, will, with this latest dieselized craft plus the ultimate in marine collecting equipment, be able to bring back alive many more of the oceans most elusive inhabitants.

One of the two model OM636 Mercedes-Benz diesel generating sets, equipped with a 7.5 kw/26 amp 120 volt Onan generator. This 4 cyl diesel with a piston displacement of 107.8 cu. in. can develop 36 hp at 3000 rpm.

DIESEL SERVICE PROGRESS

A COMMENTARY BY **GEORGE R. MACKEY**

George R. Mackey was long associated with Detroit Diesel Engine Division of General Motors Corp., and had prior experience as a mechanic in Europe and the U.S.A., which enabled him to become well acquainted in the diesel and service fields and to obtain a broad scope of the service industry from the customer's and management's viewpoint. Further training at Carnegie Tech and in the Army Ordnance during World War II provided the necessary requirements in planning service programs. Progressive advancement in diesel service areas in General Motors and with Detroit Diesel led to his position as Supervisor of Service Promotion. Upon termination of employment with General Motors in 1952, he joined Clayton Manufacturing Company, and his present position with this organization is Sales Manager of the Dynamometer Division.

Buying Equipment

EQUIPMENT purchased for use in a modern diesel service shop often involves a large portion of the establishments' total investment, therefore considerable care should be exercised in the proper selection of the equipment, the manufacturer and the immediate supplier. Because of the important role proper shop equipment plays in profitable operation of a service department, and its ability to make available the finest type of service, only the finest quality items should be considered. Second best is not good enough. In many instances selection of a needed item might be made without a careful investigation of its ability to do the intended job or the manufacturer's attitude towards assuring the buyer that proper help will be provided to be sure that everything is in order. Without this care in selection, the resulting situation may be detrimental to, instead of enhancing, an operation.

If the item furnished does not meet the full requirements it can seriously affect the quality of work performed. This often results in lack of interest in the continued use of some types of equipment, or the incomplete utilization of it in the normal flow of work through the shop. When inadequate equipment is mistakenly purchased, and when, due to the inadequacy, the person responsible for its purchase elects to limit its use as a cover-up so that management will not know of the error, a barrier is set up which may later interfere with purchase of other needed shop tools or equipment.

When a service department's interest in a specific machine or piece of shop equipment becomes known, every sales organization or salesman handling the item or similar items will naturally beat a path to the service manager's office with the hope of getting the order. This is especially true when a sizeable equipment investment is contemplated. Most organizations which will solicit this business will be legitimate establishments enjoying a good reputation and enforcing ethical practices. Such organizations present no problems; however on occasion a salesman or company with little or no concern with good business ethics may become involved in the transaction. These are the people a purchaser must protect himself against as they will generally go to any extreme to obtain the order. Often they overrate their equipment, make promises which will later be broken, and sometimes even make claims for their wares which are impractical or impossible. If they get the order, then the problems can really pile up as sometimes the equipment will only do a fraction of things claimed during the sales pitch.

When negotiating for purchase of equipment the purchaser, to fully protect himself, must be sure that the manufacturer and his sales outlet, if involved, are honorable organizations. They should be ready to: 1. furnish complete data, prints or specifications covering all details of construction and operation for the item represented, 2. put all promises in writing, and 3. furnish confirming quotations covering in detail the exact item required, its price, shipping time and terms of payment. The purchaser must also know what support and assistance he can expect, if required, when the items are delivered. Can he expect assistance at time of installation? Will the operators receive complete training in use and utilization of the equipment? If required, are operating procedures available? If required, can service be obtained? These are items your diesel engine salesman covers with your customers and they should also apply when you are the customer.

Regardless of the care taken at the time of purchase, any one of us may at sometime or another be taken in by a fast talking "slick" salesman. Even though a purchaser normally guards against such a situation, in his desire to protect his company's expenditures, he may be unconsciously influenced by the "slickster" with the rubber slide rule who can talk fast and make a transaction appear very attractive. Sometimes the so-called additional features of an item may be stressed more than its actual operation; and while these features may sound good at the time, it may later be found that the equipment will not completely fulfill the original requirement, and the much talked about features are just so much cheese cake, often not practical or necessary.

A guide to the manager of a diesel service shop interested in purchasing equipment is to force the supplier or his representative to present the same type of facts and figures as is done by his own engine sales force when presenting a proposal to an engine prospect. Such a proposal usually includes engine performance specifications, power curves, dimensions, installation requirements and other evidence to prove the engine will meet the customers requirements. The purchaser of any equipment should demand this type of information before placing an order. Furthermore, if outside facilities such as air or electrical connections are required these should also be covered in detail.

The equipment manufacturer's sales and service organization is another important consideration that must not be overlooked. While some manufacturers prefer to sell direct, or through agents, others work through franchised distributors with salaried field personnel supervising programs and sales activities. Regardless of the type of sales organization, care should be exercised in selection of a reputable manufacturer and supplier. Many purchasers request a list of other shops using the particular make and model of item in which they are interested. With such a list, inquiries can easily be made to determine if all the facts are exactly as presented and performance as claimed.

The availability of service, a familiar subject to all up-to-date diesel service shops, is another factor that must not be overlooked during selection of equipment. This subject must be clearly defined, especially when purchases are made directly from a manufacturer whose place of business may be a considerable distance from the purchaser. An approach to learning the answer to this might be to find out how far the sales representative travelled to solicit the business. If this distance is great, will the manufacturer take as much interest towards servicing the equipment as he does to solicit an order for his product. While many of these ideas are very familiar to most service managers, sometimes during the normal pressure of everyday business activities some are often overlooked. Purchases made carefully, with proper thought towards all possible influencing factors, will pay dividends and fulfill the requirements which stimulated the original interest. Such purchases will advance a service department's programs to sell quality service.

Ten Diesel Tractors Added to St. Louis Fleet

Top officials of Husmann & Roper Freight Lines, Inc., and International Harvester Co. met here recently when delivery was completed on a 10-unit fleet modernization and expansion purchase. Taking part in the delivery are (left to right) Brooks McCormick, IH executive vice president; Barr Crawford, International truck district manager in St. Louis; Guy Roper, Husmann & Roper board chairman; and D. B. Guthrie, H&R executive vice president. The new International model DCOT-405 tractors will be used to effect greater equipment utilization and improve schedules throughout the five-state operating territory of Husmann

& Roper and its Schien Truck Lines western division. According to Roper, the new heavy-duty diesel models are set for around-the-clock schedules. Their use will permit a substantial reduction in the number of power units required for over-the-road service, while benefiting customers by cutting running time of longer schedules. The 134 in. wheelbase tractors are powered by Cummins NH-180 engines and are equipped with 72 in. cabs, ten-speed RoadRanger transmissions, side-mounted 150 gal. fuel tanks, and V-belt drive pusher axles with Page & Page suspension and 45-55 weight distribution. The firm operates 155 trucks and tractors and 275 trailers.

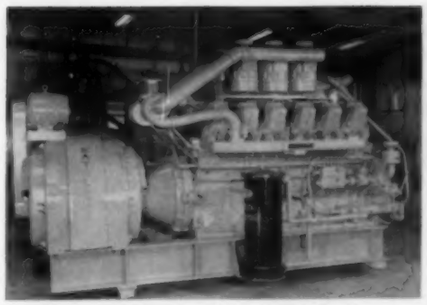
Assistant Sales Manager

H. C. Foster

H. C. Foster has been appointed assistant sales manager for the Gillett & Eaton, Inc., a division of Gould-National Batteries Inc., of St. Paul, Minn. Mr. Foster has been with Gillett & Eaton since March, 1955, as sales engineer for the mid central states. Prior to 1955 he worked for other companies in the piston, ring, and sleeve fields.

Generator Applications Listings, Photos Available

Katolight Corp. of Mankato, Minn., has announced availability of a listing and packet of photographs of interesting applications on their larger sizes of gasoline, natural gas, and diesel installations. Shown here is a typical unit in the larger class rated 400 KW, 500 KVA, 3 phase, 480 volt, 900 rpm, consisting of a Kato generator driven by a model VLRDBCSU turbocharged Waukesha diesel engine. Note Winslow lube oil filter. This unit is similar to several presently being supplied to the Bomarc Missile Facilities for use as emergency power, and, also, many air bases, utilities, hospitals, and institutions, with all equipment meeting the most rigid requirements. Katolight also manufactures smaller portable gasoline models with the standard line ranging from 500 watts through 150 kw and larger models available through 750 kw.



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AP935

WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **BERNARD W. LANSDOWNE**

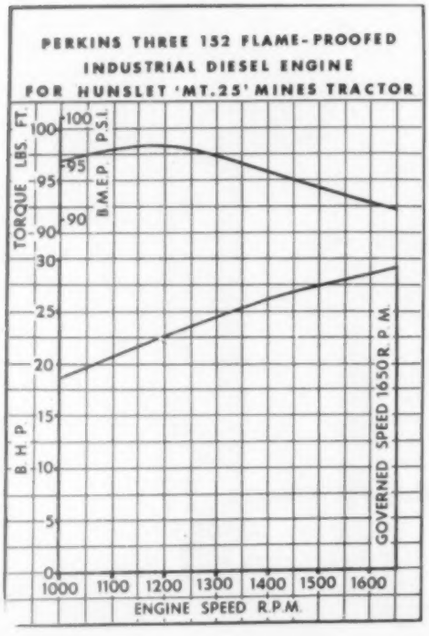
Bernard W. Lansdowne is an associate member of the Institution of Mechanical Engineers and is widely known among British and European diesel manufacturers as a former editor of our English contemporary "Gas & Oil Power." His early workshop training was spread over seven years with A.E.C. Ltd., Southall, following which he served some five years with that company's sales engineering department. He is now manager-for-the-United Kingdom of a group of business and technical publications.

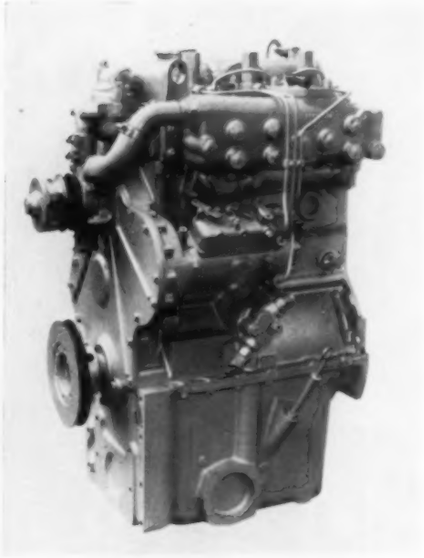
Perkins Diesel for Flame-Proof Equipment

A NEW diesel product from Perkins Engines Ltd., of Peterborough, is a 3 cylinder diesel engine designed for installation in flame-proofed vehicles and industrial equipment. The new engine is the Perkins Three-152 (Flame-proofed) and has been designed to comply with British Ministry of Powers flame-proofing requirements. It has also been produced to meet the needs of manufacturers of equipment for use in mines and other sites where there is risk of explosion from dust or gases.

The Hunslet Engine Co. Ltd. of Leeds has chosen the new power unit as the prime mover in their new MT 25 mines tractor. This tractor has already been granted a British Ministry "Buxton" certificate permitting its use in coal mines. It is designed to work in areas adjacent to the coal face where dust and methane gas may be encountered.

The Perkins Three-152 has cylinder dimensions of 3.6 in. bore by 5 in. stroke giving a cubic capacity





Perkins Three-152 (Flame-proof) diesel engine.

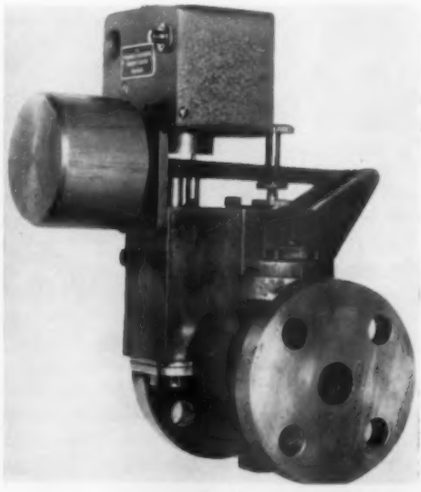
of 152 cu. in. It develops 29 b.h.p. at 1,650 rpm. Among the special design features for flame-proof operation are a water-jacketed exhaust manifold to cool the exhaust gases; special cylinder heads, gasket and cylinder fixing stud holes machined to comply with "Buxton" certificate requirements; specially wide joint facings on the cylinder head for mounting the induction flame trap and fuel atomizer seatings arranged to conform with flame-proofing regulations.

For full flame-proofing, individual equipment manufacturers installing the engine as a power unit will supply additional fittings including an exhaust gas conditioner and induction flame trap together with an approved non-electric starting device to suit individual requirements. Other important design features of the engine include chrome-plated steel liners, a rotary type fuel injection pump with an integral mechanical governor, replaceable pre-finished main and big-end bearings and gear driven timing. The overall size of the engine is such that it could be installed in machines of only 3 ft. overall width including wheels, with the overall height kept down to a minimum of 3 ft. 5 in.

Automatic Valve for Air Starting

AN air valve designed to automatically admit compressed air to the starting system of emergency diesel generating sets when outside power failure occurs has been developed by the Pyropress Engineering Co. Ltd., of Bedford, England in conjunction with the U.K. Atomic Energy Authority. The air valve can be used on an air-in-cylinder starting system as well as on a Bendix pinion type air motor starter. Its method of operation is as follows: When the normal mains supply is on a solenoid is energized and the valve is kept in the closed position with air at normal pressure being fed to the inlet side of the valve. If mains failure occurs the solenoid is de-energized allowing the plunger to drop, thus releasing, through a ball-catch mechanism, the weighted lever which in turn repositions the pilot air valve allowing air at pressure to pass through to the power piston which in turn opens the main air valve. Air is thus allowed through the valve to the engine cylinders or alternatively to a conventional starting air-motor of the type fitted with a Bendix pinion. When the engine is running at speed a resetting cylinder, powered by lubricating oil pressure, allows the mechanism to be readied for the next start.

Pyropress' air valve for diesel engine starting systems.



American Bosch Reorganizes Commercial, Military Sales

R. L. Countryman

Reorganization of commercial and military sales of American Bosch Arma Corp. into two separate activities has been announced by Charles W. Perelle, president. The move is part of a general reshuffling of corporate function, Perelle stated, to develop a sales organization geared to meet the changing needs of commercial and military customers. Commercial sales of American Bosch Arma will be under a new division, the American Bosch Sales Division, headquartered in Springfield, Mass. Division manager is Ralph L. Countryman, newly appointed vice president, who joined American Bosch Arma from the Oliver Corp. Its sales personnel will handle products from three divisions of the corporation. All military sales of American Bosch Arma products will be under the direction of W. Paul Smith, vice president. C. A. Sharpe, senior vice president, will assume operational responsibility for all divisions and subsidiaries as a step in streamlining corporate control and relieving Mr. Perelle of much detail work. In addition, Mac T. Finley was named acting Secretary of American Bosch Arma. Mr. Finley retains his previous post as Assistant to the President. Mr. Countryman brings to his new position a background of over 30 years in sales and merchandising for national firms in domestic and foreign markets. Since 1957 he was with Oliver Corp. as general sales manager and, later general manager of its Outboard Motor Division.

Winslow Appointment

John R. Bacher

Appointment of John R. Bacher to the position of manager, Service and Applications, has been announced by Winslow Engineering and Manufacturing Co., Oakland, Calif., producers of Winslow oil filters and elements. Bacher, a 14-year veteran of the Winslow organization, will be in charge of product service throughout the United States. John A. Vollstedt has been appointed Sales Engineer at Winslow's head office in Oakland. Cecil A. Grey was recently added to the firm's sales staff, operating out of offices in Birmingham, Ala. and C. E. Barney Oldfield represents Winslow in the Rocky Mountain area.

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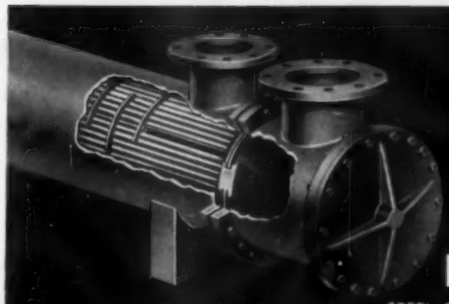

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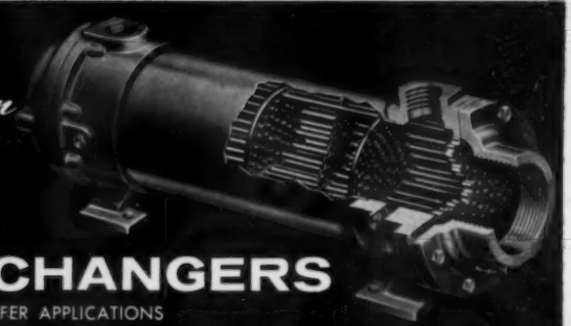

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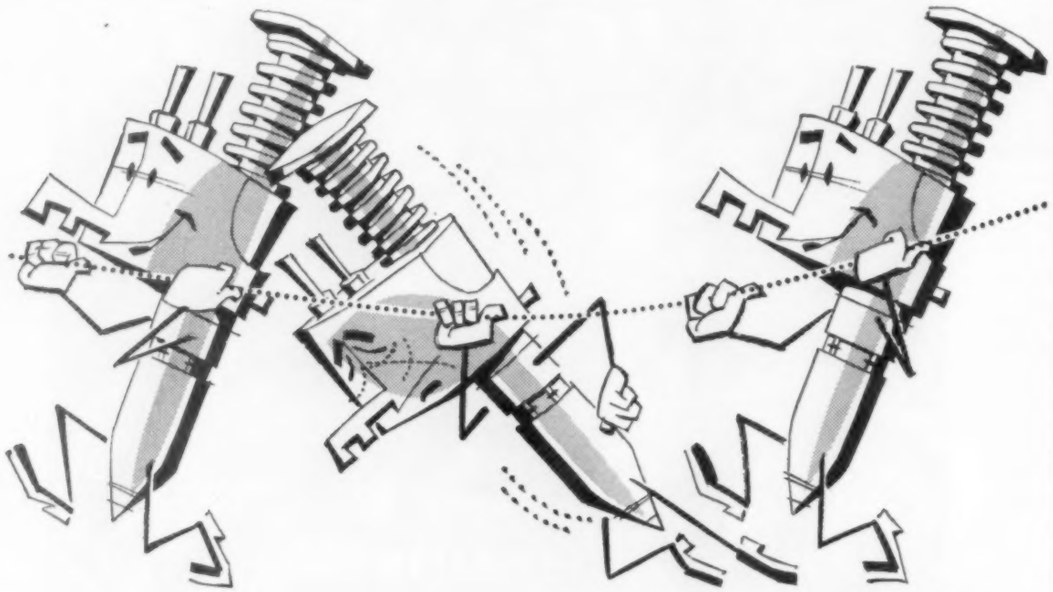
Named to New Posts For Allis-Chalmers

Election of J. D. Greensward as president, Canadian Allis-Chalmers Limited, a wholly owned Allis-Chalmers subsidiary, was announced recently. He succeeds Harold M. Schudt who has been named director of manufacturing, Allis-Chalmers International. Mr. Greensward has been director of manufacturing, Industries Group, and a vice president of Allis-Chalmers since 1952. He joined Allis-Chalmers in 1922. As president of the subsidiary, Greensward will be in charge of heavy machinery operations in Canada which include manufacturing plants at Lachine, Quebec; St. Thomas, Ontario; and sales offices in major Canadian cities. Mr. Schudt in his new position will direct the manufacturing activities for the firm's foreign plants. Allis-Chalmers now has plants located in Essendine, England: Mexico, D. F., Mexico; Milan, Italy, and Newcastle, Australia. His past experience includes the establishment of Allis-Chalmers first manufacturing operations in England where small farm tractors were produced.



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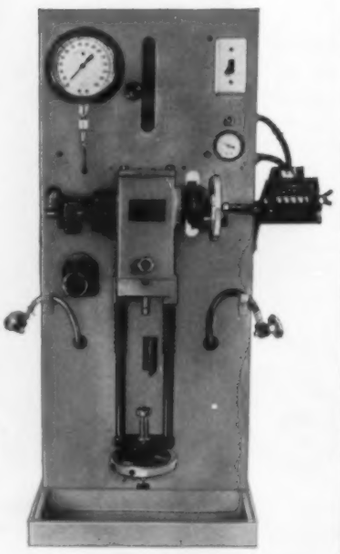

J8686 Injector Comparator

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Florida Diesel News

By Ed Dennis

FLORIDA-Georgia Tractor Co., Tampa, delivered to the Pinellas County Commissioners, for road work, a Payloader model 50 tractor shovel powered by an International UD 282 diesel engine (95 hp at 1800 rpm) with a torque converter, and a Galion dieselized road roller.

OVER at Bonita Springs, W. A. Mack operates a 45x24 ft. sand dredge for river and coastal work. It is powered by a VTM 12 cylinder Cummins diesel rated 410 hp at 1800 rpm, has Snow Nabstedt 3.9:1 r&r gears and Falk steel couplings. The 12x10 in. Maddox pump handles about 200 cu. yds. of sand per hr. A 132 hp model H Cummins supplies power for the 75 kw ac generator.

GENERAL Engine & Equipment Co., Tampa, repowered a Michigan No. 125 front end loader with a GM 3-71 diesel for Cone Bros., road contractors of Tampa. They also repowered a 19 B Bucyrus-Erie crane with a GM 3030 diesel and GM power take-off for W. P. Mc Donald Corp. of Brooksville.

DOWN at Perrine, M. T. Hagen Farms took delivery of a new Cat powered irrigation pump unit. The SS6H100N Rainmaster pump is close coupled to a model D320 turbocharged Caterpillar diesel engine which has a horsepower output of 130 at 2400 rpm, from Shelley Tractor & Equipment Co., Miami, Florida.

AT Marathon, the charter fishing boat, *Amber Jack*, was repowered with a four cylinder Ford 68 hp diesel engine and Capital 2:1 r&r gears. The Ford diesel was marined by Modern Diesel Power of Tampa.

THE Wiliston Shell Rock Products of Wiliston, took delivery of three TS-260 Allis-Chalmers motor scrapers (17 yds. heaped) powered by Allis-Chalmers 16000 diesel engines having a 230 hp at 2000 rpm, from Richardson Tractor Co. of Tampa.

FOUR Superior 750 kw diesel generating sets for military use near Ponce, Puerto Rico. These model 60-SX-6 turbocharged six cylinder 12x15 in. Superior diesels drive 750 kw 2400/4160 volt Ideal generators. Also included were Kittell silencers, Woodward UG 8 governors, Hilco lube oil filters and Young lube oil coolers and radiators.

NATIONAL Airlines at Miami International Airport had a 150 kw standby generating set installed in their administration building. The 150 kva Delco generator is powered by a 6-110 General

Motors diesel engine. The unit was supplied by the Miami office of Detroit Diesel Div. GM.

TWO International Harvester TD18 tractors are among the road construction equipment being used by Wynn-Warren Construction Co. near Venice. These TD18 dozers are powered by six cylinder International diesel engines with 128 belt hp.

IT was gratifying to learn that the 167 foot dredge *Barbados,* which is owned by the Caribbean Dredging Co. of Nassau, was designed by the Erickson Engineering Co. of Tampa. The dredge's 27 in. American designed sand pump is powered by two six cylinder M.W.M. diesels having a total of 3000 hp at the pump. It was the first dredger of typical American design to be built in Europe.

THE City of Naples received, from Neff Machinery of Tampa, a model LD5TD Scoopmobile (front end loader). This is powered with a model 190 DLC Waukesha diesel rated 72 hp at 2000 rpm.

INTERNATIONAL diesels, two of them, working for General American Transportation Co. at Tampa, building a liquid sulphur storage tank (1,000,000 gals). The model UD24 International 100 kw generating unit is being used for welding and air compressors and the TD15 Crawler tractor is used for construction work.

OVER at Wauchula, J. D. Albriton received from Florida-Georgia Tractor Co., Tampa, a Galion 118 motor grader powered with a UD554 International diesel rated 150 hp at 2300 rpm.

THE City of Starke municipal light plant is converting to dual fuel so they can use natural gas. Five model 80-S X 8 Superior 1000 kw diesel generating units are in this new phase of change over operation.

A total of 7700 hp in the dredge *Gahagan* owned by Gahagan Dredging Co. and presently berthed at Tampa. The 27 inch pump is powered by a 4500 hp Cooper-Bessemer diesel. The three Cleveland Diesel auxiliary and generating units total 3200 hp. The dredge was designed by Erickson Engineering Co. and was built by Dade Drydock Co.

THE Florida-Georgia Tractor Co. was reorganized into two segments. Orlando, Jacksonville and Tallahassee come under the A. E. Finley Tractor Co. and Lakeland, Tampa and Miami come under Florida-Georgia Tractor Co. Both firms handle the International Harvester Co. and Frank G. Hough Co. lines of dieselized road construction equipment.

A Mercedes-Benz model OM321 diesel was installed in a Pettibone carry lift for Jackson Sawmill of Mobile, Ala. by Service Center of the same city. This 96 hp diesel replaced a gasoline engine. The fuel consumption dropped to 25 gal. per day.

UP at New Port Richey the Floramar Developing Co. took delivery of two TD15 International crawler tractors powered with a 105 hp six cylinder D554 International diesel from Florida-Georgia Tractor Co., Tampa.

LLEWELLYN Machinery delivered two model 22B Bucyrus Erie draglines, one to Lanehart Construction Co. with a General Motors 3-71 diesel and the other to Wilson Construction Co. with a Caterpillar D318. Both have Rockford clutches and both firms are in Bartow.

THE tandem General Motors 8V-71 diesel installed by Kennedy Marine Engine Co. of Biloxi, Miss., is the first of several similar installations to be made on several new twin screw 150 ft. Gulf of Mexico menhaden fishing vessels. Each tandem is rated 456 shp at 1800 rpm.

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Completely New DIESELPAK—designed for operators with frequent pack or oil change intervals. ***Costs less*** than ineffective substitutes because it gives ***more miles of effective filtration.*** Has same ***exclusive*** patented Luber-finer DIESELPAK filtering process.

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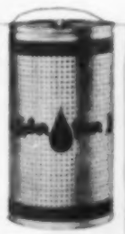

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Expand Output

Facilities for production of thermocouple and other pyrometer supplies have been expanded by Minneapolis-Honeywell's Brown Instruments Division to meet an increasing industry demand for temperature-sensing elements. Operations in Philadelphia, principal manufacturing center for the company's industrial process instrumentation, have been streamlined and moved to new quarters. In Los Angeles, assembly and stocking of thermocouples and pyrometer accessories is being carried out in a new plant. The Los Angeles facility was set up in 1959 to facilitate distribution in the area west of the Rocky Mountains. "New and more efficient facilities will enable Honeywell to keep pace with a growing market in the high temperature area and, at the same time, substantially shorten delivery schedules of standard products," said John B. Moxness, Brown Instruments market manager. High-temperature thermocouples for gas turbine engines, missile and rocket engine applications are expected to be an "appreciable" part of sales by the end of 1960, Moxness said.

Witte Diesel Engine-Generator Units are Built Low, Time-Tested and Packed with Endurance

Especially built for demanding refrigeration service, the Witte Model 100RDA, Type "E", 12½ KW Diesel Engine-Generator Unit has a 60 cycle-40 cycle brushless generator and Witte two-cylinder, horizontally-opposed, 4 cycle Diesel Engine.

The Railway Mechanical Refrigeration Industry is relatively new . . . yet Witte has been active as a power supplier in the field for over five years. Repeat orders from users attest to built-in quality and reliable performance. These fine railroad units are backed by a world-known organization.

Witte . . . noted for long-lived, continuous-running engines . . . is continually proving the capability of this railway unit in mechanical refrigeration applications—where only a "live" engine is an acceptable one.

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Accessibility of all parts makes the Witte easy to operate . . . easy to maintain.

1. Oversize radiator—operates at up to 150°F. ambient.
2. Air-venting, static-head fuel chamber built into injection pump—eliminates shutdown from air leaks in car's fuel system.
3. Dry type air cleaners—quickly and easily serviced.
4. Ether injection system—for cold starting.
5. Starting control (one lever provides all starting functions).
6. Stop control.
7. Extra length, lube-oil, dump hose—completely drains sump.
8. Extra-heavy, rigid, skid-support with oversize shock mounts.
9. Two-speed engine control (1800 rpm—"pull-down" speed) for maximum fuel economy (1200 rpm—"holding" speed) Thermostat actuated.
10. Primary and secondary fuel filters.
11. Bypass, Full Flow lube oil filters—1200 hr. change period.
12. 12½ KW (continuous rating) brushless generator—operates at 60 cycles ("pull-down") 40 cycles ("holding").
13. Mechanical, safety shutdown—built into injection pump.
14. Load Compensator Switch—extends the functioning of the mechanical safety control to meet abnormal, transient temperature conditions.
15. Center-of-Mass of the Witte unit is less than 16 inches off the car floor—optimum installation to handle car humps, shocks and over-the-road vibration.

All accessories are readily accessible.

Mid-West Diesel News

By **L. H. Houck**

NEW up-to-date quarry operation at Brownington, Mo., has Allis-Chalmers equipment from Newlin Machinery Corp., Kansas City. Main diesels are an Allis-Chalmers 21000 and a 516. Newlin supplied a Diamond crusher, too.

CUMMINS HRC-4P diesel to Dwight Whipple, Tunas, Mo., with Twin Disc clutch from Cummins Kansas City, Joplin, for new sawmill operation.

CHEMICAL Express, Dallas, 120 Kenworth 922's, tilting "Uniglas" front ends, highway trucks for hauling bulk cement. Power is Cummins NH-220 diesels, Fuller R-96 transmissions, Timken R-200 drive axles, TK-560 trailing axles.

YELLOW Transit, Kansas City, has installed a Cummins C-105 in a Ford city delivery unit in Joplin. Transmission and rear axle unchanged. C-105 displaces 309 cu. in., rated 105 hp at 2500 rpm, four cylinders. Pilot job installed and sold by Cummins Kansas City, Joplin, Mo., branch.

R. H. Young & Son, machinery dealers, Fort Smith, Ark., with branches in Little Rock, Oklahoma City and Tulsa, has been appointed distributors for Michigan tractor shovels, dozers and scrapers of the Clark Co., for Oklahoma. Leading diesels are optional equipment on Michigans.

INLAND GM Diesel, Milwaukee, installed a 4-53 GM diesel in a Michigan 75A front-end loader owned by Milwaukee Underground Construction Co., Milwaukee.

PETERSON Boat Builders, Sturgeon Bay, Wis., took delivery on two 3-53 GM diesels equipped with heat exchangers for installation in the yacht, "Utopia." Sale by Inland, Milwaukee.

OLYMPUS, Inc., Greenfield, Mo., has a new Michigan from Charles Dunn Machinery Co., Kansas City, equipped with a 197-DCL Waukesha diesel, 302 cu. in., and Clark torque converter transmission.

OLDHAM Quarry, Liberty, Mo., a 135-DKB Waukesha diesel from Dunn Machinery Co., 426 cu. in. engine, in Michigan front end loader.

SAWMILL of Oral Renner, Lebanon, Mo., a Cummins power unit—C-1-60P—6 cylinder, 160 hp with Twin Disc clutch, from Cummins Kansas City, Joplin, Mo.

NEWLIN Machinery Corp., Kansas City, delivered 11-E dozer with Allis Chal-

mers 516 diesel to Virgil Frederick, Easton, Kan., soil conservation contractor.

INLAND GM Diesel, Inc., Milwaukee, installed a 4-71 GM diesel in an AW 99 grader owned by the city of Platteville, Wis.

MAAS & Son, quarry operators at Bolivar, Mo., have installed a Cummins HR6P 175 hp diesel on a Cedarapids crusher, with Twin Disc clutch. Sale by Cummins Kansas City, Joplin.

WILLIAMS Quarry Co., Clinton, Mo., two Michigan tractor shovels with Clark torque converters and Waukesha 197-DLC, 302 cu. in. engines, from Dunn Machinery Co., Kansas City, Mo.

TWO P & H cranes, 1 yd. capacity, with P & H diesel engines and Magnatorque controls to L. G. Barcus & Sons, Kansas City, Kan., from Newlin Machinery Corp.

ORRICK Stone Co., Orrick, Mo., a 365 cfm LeRoi air compressor with 4-71 GM diesel, from Newlin Machinery Corp., Kansas City.

UNIQUE crusher, a Bros "Preparator" an impact reduction machine which crushes rock on the ground, sold to Pottawatomie Co., Kansas by Newlin Machinery Corp. Power is Cummins HRS-6-1P.

NEWLIN Machinery Corp., Kansas City, have a new machinery delivery tractor —White with Cummins 6 cyl. diesel, pulling a flat bed trailer.

INLAND GM Diesel Corp., fabricated and delivered a 100 kw generator set with a 6-71 GM diesel for use on an asphalt plant.

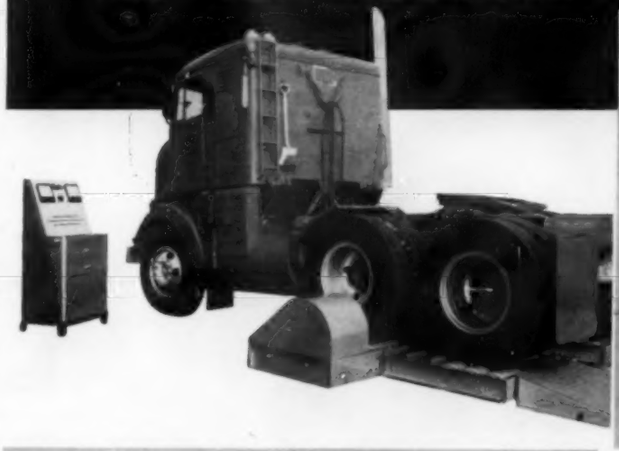
HACKLER & Limpus Quarry, Archie, Mo., has a Cummins NHRIS6P, 320 hp diesel for a Gruendler hammermill, using Twin Disc clutch, from Cummins Kansas City, Joplin.

New Cargill Towboat

A $1,500,000 towboat will be built for Cargo Carriers, Inc., according to Lewis L. Crosby, president of the transportation firm, which is an affiliate of Cargill, Inc., national handler and processor of farm products. Mr. Crosby said the 6,150 horsepower, diesel, triple-screw steel vessel will begin handling cargo barges on the nation's inland waterways in November. It will be named the *Austen S. Cargill* in honor of the former Cargill board chairman who died three years ago. The contract for construction has been awarded the St. Louis Shipbuilding & Steel Co. The boat is intended for use primarily on the lower Mississippi River system, between St. Louis and New Orleans, Crosby said, with grain as its main cargo downbound, and salt, fertilizer, chemicals and other bulk commodities upbound. He estimated the unit will be capable of towing up to 32 jumbo barges, each loaded with approximately 48,000 bushels of grain. The vessel's three 2,050 hp engines will be manufactured by the Cooper-Bessemer Corp. of Mount Vernon, Ohio. The new unit will be 182 ft. long over-all, 55 ft. wide and have a depth of 12 ft. It will rise approximately 50 ft. from the water line to the top of its radar antenna. The vessel will have three decks, with pilot house atop, all air-conditioned. It will feature the latest in electronic navigation and communication equipment, Crosby said.

READY NOW! The completely new 1960 edition of the **DIESEL AND GAS ENGINE CATALOG,** Volume 25, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 442 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover. Send your order in now for this limited edition, which costs just $10 postpaid anywhere in the world to **DIESEL AND GAS ENGINE CATALOG,** 9110 Sunset Blvd., Los Angeles 46, Calif.

THERE'S A Clayton DYNAMOMETER FOR EVERY HORSEPOWER NEED



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CHASSIS DYNAMOMETERS
. . . from 150 to 800 rear wheel h.p.

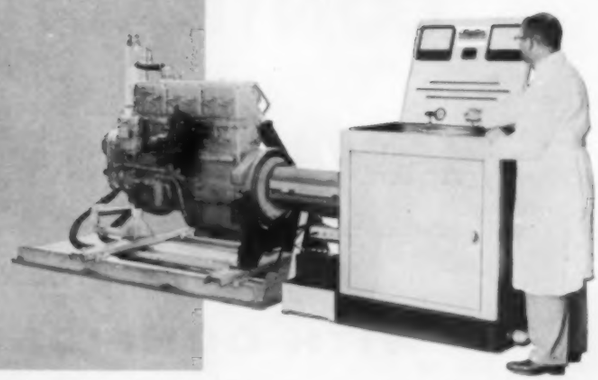
Don't throw away any power built into your truck engine. Trucks operating at specified power get better fuel mileage and give better service. Only the use of a Clayton Chassis Dynamometer can assure *power proved performance.* Permits truck testing under actual driving conditions without leaving the shop. Simple to operate . . . easy to install.

There is a Clayton Chassis Dynamometer to fill every requirement

A complete line of
ENGINE DYNAMOMETERS
. . . from 5 to 6000 horsepower for testing gas or diesel engines

Clayton Engine Dynamometers and Universal Test Stands are designed for "run-in" and test of all types of gasoline or diesel engines, and power units equipped with mechanical clutches or torque converters. Quickly and accurately determines actual performance of new or rebuilt engines. Torque loads can be maintained indefinitely or changed at will. Engines installed in minutes . . . automatic alignment.

There is a Clayton Engine Dynamometer Model to handle any engine



UNIVERSAL TRACTOR TEST EQUIPMENT
. . . FOR TESTING ALL POPULAR TRACTOR MAKES

Clayton Dynamometers can be used to test any tractor when used with Universal Tractor Test Equipment. Installed separately or in combination with the Universal Engine Test Stand, it provides complete facilities for testing engines without removing them from the tractor. Will also test tractors and heavy duty rubber tired construction vehicles equipped with power take-off drives, driving through mechanical transmission or torque converter.

There is Clayton Universal Tractor Test Equipment to test any tractor

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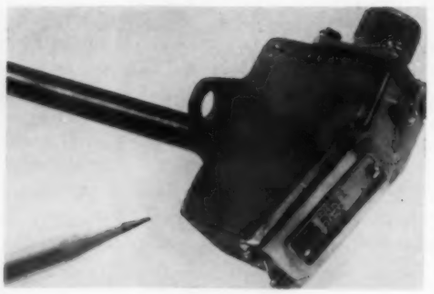
WRITE FOR FULL INFORMATION ON ANY OF THE ABOVE EQUIPMENT

Flameout Detector

A simple, reliable system for automatically detecting jet engine flameout, then turning on ignition for immediate light-off, has been developed by Garrett AiResearch, Phoenix. It is designed to provide the same re-start results in a flameout as continuous ignition. In operation, a thermostatic switch located in the turbine exhaust stream remains open at normal turbine operating temperatures within a range of 1200 to 400° F. Below 400° F the switch is ordinarily closed. Any sudden drop in turbine exhaust temperature, such as exists in a flameout, closes the circuit, automatically cutting in ignition for rapid engine restarting. A visual, and/or audible signal to the pilot may also be incorporated. Once a restart is successful and the turbine exhaust attains a steady, normal temperature, a switch opens shutting off ignition.

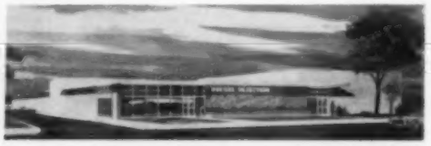


H. E. Hanson Named F-M Beloit Div. Manager

H. E. Hanson

H. E. Hanson has been named vice president of Fairbanks, Morse & Co. by the board of directors. He was also appointed as general manager of the Beloit (Wis.,) Division, of the company by G. R. Anderson, executive vice president, operations. Mr. Hanson came to Beloit in October, 1959 as general manager of the Diesel, Engine, Compressor, Locomotive Group and has been acting manager of the Division since January of this year. He joined the Company in 1934. A native of St. Paul, Minn., Mr. Hanson went to work as a draftsman in the St. Paul Branch, upon his graduation from the University of Minnesota in mechanical engineering. Moving up through the diesel sales department as a sales engineer, he became department manager in 1943 and later branch manager of St. Paul in 1953. His promotion to the Beloit Product Group managership followed in 1959.

New Plant, Office



Construction began recently on a modern $250,000 headquarters plant and office for Diesel Injection Sales and Service, Inc., Norfolk, Va. H. E. Wittersheim, president said the structure is scheduled for completion late this year. It will be air-conditioned and will contain 28,000 sq. ft. of floor space, more than 3 times that of the present plant. New equipment to be added will include Clayton 500 hp chassis and engine dynamometers. Diesel Injection specializes in fuel injection units and allied equipment for the railroad, marine, motor transportation, construction, and the power industries. It is also supplier for Leslie Hartridge test and repair equipment to the entire diesel industry in this country. The firm has branch operations at Richmond and Salem, Virginia, and Charlotte and Raleigh, North Carolina. (Architect's sketch by Woodward and Smith, Norfolk)

Alco Vice President

W. G. Miller

The board of directors of Alco Products, Inc. has elected William G. Miller as a vice president of the company. A director of Alco, he had been president of the firm's Canadian affiliate, Montreal Locomotive Works, Ltd. In his new position Miller will reorganize the company's foreign sales department in line with the expanding nature of Alco's overseas business. Before becoming president of Montreal Locomotive in 1954, Miller had been with Alco in a number of executive positions.

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DIESEL ENGINES
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Perkins has sales and service facilities in 143 countries. For details on Perkins Diesel Engines for construction applications, write:

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Ask for address of nearest Perkins sales depot in U.S.A.

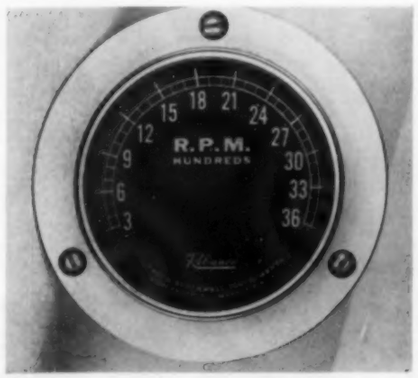
6008

Automatic Bypass Valve For Filter Replacement

A new automatic bypass valve permits oil filter replacement without engine shutdown. Mounted on the filter base, the device is applicable to Caterpillar engines with two filters or more when specifications call for continuous running of the engine. The attachment consists of two levers, one for each filter, and an interlocking safeguard device that automatically prevents oil flow stoppage through both filters at the same time. By placing one lever in an upright position, all oil is forcefed through one filter during the time taken to mount the replacement element in the other filter. Further information on this automatic bypass valve can be obtained by writing to Engine Division, Peterson Tractor Co., 955 First Ave., San Leandro, Calif. (ITS NEW)

New Tachometer Model

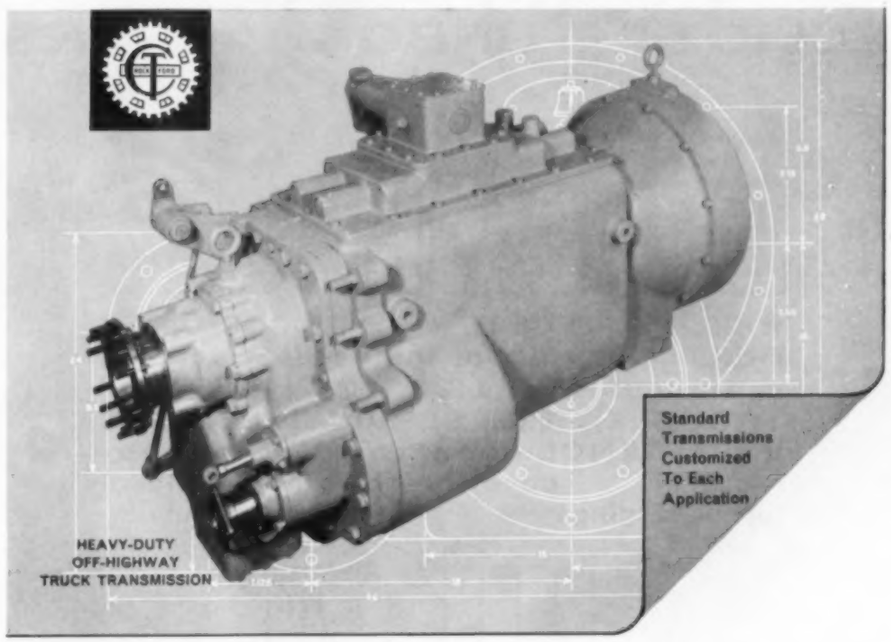
A major redesign of the Reliance tachometer has just been announced by Barbour Stockwell Instruments. The new design with greatly improved readability was achieved by Clifford O. Stubbs, prominent Boston industrial designer. It incorporates an easy-to-read indicator and quick vision scale. According to Stubbs, the new design should make this tachometer more easily read from a distance, or under adverse visibility conditions with greater accuracy. "Prototypes of this new Reliance tachometer have already met with enthusiastic acceptance by engine, equipment and machinery builders," states Sales Manager, N. B. Perkins. "In addition to this 'new look' an expanded research and development program over the past two years has resulted in an improved, more rugged, more accurate and longer lived instrument." Descriptive literature is available from Barbour Stockwell Instruments, 80 Cambridge St., Worcester 3, Mass. (ITS NEW)



Turbine Fire Trucks

Said to be the world's first, gas turbine-powered fire trucks have been ordered by the cities of Seattle and San Francisco Fire Departments. Both fire trucks, built by the American LaFrance Corporation of Elmira, N. Y., will be powered by a 325 hp gas turbine produced by the Boeing Industrial Products Division of Seattle. American LaFrance, using the Boeing turbine as the powerplant, was recently successful bidder for a new Seattle 100-ft. aerial ladder truck and a 1,000 gpm San Francisco pumper. The large aerial ladder truck has a gross weight of 32,500 lbs and the pumper weighs 30,000 lbs. The Boeing turbine weighs 325 pounds or about one per cent of the

total truck weight. The Boeing turbine has high torque performance at low speeds. This will give the fire apparatus improved acceleration and hill climbing capabilities. With turbine power these giant fire trucks are designed to accelerate from zero to 55 mph in 34 seconds. The Boeing turbine also requires no warm up before starting on a fire call and uses a conventional transmission. American LaFrance will install production Boeing turbines in the units at Elmira.



Solve your heavy-duty power problems with Cotta heavy-duty transmissions

Is full engine power out of reach for your machine because the gearbox can't handle heavy-duty loads? Cotta power transmission *specialists* can customize standard transmissions to meet your individual heavy machinery requirements: multiple speeds, forward and reverse, space limitations, continuous day-and-night operation, weight, and mounting.

150 to 2,500 ft-lb input torque capacities

Cotta takes over where standard transmissions quit . . . in 100 to 750-hp ranges . . . in capacities from 150 to 2,500 ft-lb input torque. For half a century, Cotta "engineered-to-order" transmissions have been leaders of power to profit on drilling rigs, rock crushers, pumps, power shovels, locomotives, generators, and other equipment demanding long hours of trouble-free operation in the field.

Diagrams sent free on request

See our catalog in *Sweet's Product Design File*. Check the detailed descriptions and specifications on standard and custom applications. Then call Cotta (TWX-RK-7720 or phone WO 4-5671) for details on precision-built transmissions designed especially to handle your heavy-duty power problem.

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SAVE MONEY WITH
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diesel service incorporated
2093 East 19th St., Cleveland 15, Ohio
America's largest GM fuel injector rebuilder

Dahlund Heads D.C.L. Section at Fairbanks, Morse

E. L. Dahlund

Ervin L. Dahlund has been appointed general manager of the D.C.L. Group (Diesel Engines, Compressors, Locomotives) of Fairbanks, Morse & Co. Mr. Dahlund joined Fairbanks, Morse at Beloit in 1936 following a year as an instructor at University of North Dakota where he had received his degree in Mechanical Engineering. In 1948 he was loaned to the Diesel Engine Manufacturer's Association as educational director and secretary, chief engineers' committee. He returned to Beloit in 1949, as chief diesel engineer and remained until 1956, when he was employed as director of engineering for the Albuquerque Division of ACF Industries, Inc. He is a past chairman of the Oil & Gas Power Division of ASME.

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EXPERIENCE?

★ 20 YEARS OF IT! ★ 25,000 UNITS BUILT! . . . most of the earliest are still operating! ★ BILLIONS OF HOURS OF TROUBLE-FREE SERVICE! ★ MORE EXPERIENCE than any U. S. manufacturer . . . covering the whole field of turbocharging!

ACTION?

★ BOOST your diesel engine performance, output and operation with . . .

MD-1

Tug *W. H. Ward*

The heavy-duty tug *W. H. Ward* has been completed by Gladding-Hearn Shipbuilding Corp. and delivered to North Atlantic Dredging Company of Boston, Mass. The 43 ft. 6 in. tug is designed as a tender for a hydraulic dredge used in shallow and sometimes quite narrow areas along the New England Coast. Design requirements were that the boat be husky enough to take frequent groundings both forward and aft, be able to break ice as a routine chore, work with 5 ft. 6 in. draft, yet carry 1300 gals. of fuel and be able to tow the dredge and its equipment along

the coast from job to job. The pilot house is large enough and fitted with a seat across the after end so that crews may be carried to and from the dredge under cover in bad weather. Power is furnished by a General Motors 6-110 diesel engine rated 220 hp at 1800 rpm. This engine drives a five-bladed 36 in. x 28 in. Ferguson propeller through an Allison 2:1 reduction gear and a 3 in. monel shaft. All engine controls and instruments are in the pilot house and additional protection is provided by a lube oil/water temperature alarm system. The stern tube bearing is a flanged Goodrich Cutless rubber bearing and a sealed ball bearing supports the shaft in the engine room. The rudder is hung on a ball carrier bearing under the quadrant and turns in a rubber bearing at the lower end. Ease of steering was particularly noted by the owners during trials. The Buell air horn atop the pilot house is operated from a small tank supplied by a Bendix-Westinghouse compressor driven off the main engine. Heat for engine room, pilot house and quarters is provided by a diesel oil burning heater in the engine room.

Engineering Vice President

C. J. Kremer, Jr.

Charles J. Kremer, Jr. has been promoted to the position of vice president of C. Lee Cook Company, piston ring and packing manufacturer and a division of the Dover Corporation, it was announced by P. W. Mettling, president. Kremer is the new vice president in charge of engineering. He joined the company in 1927, and has served as Chief Engineer since 1939.

Truck Performance Rule

A new slide rule that mathematically measures truck performance in a few seconds has been developed by The White Motor Co. The precision instrument, built to White's specifications by Perrygraf Corp. of Los Angeles, eliminates extensive paper work in determining what horsepower is required to obtain a desired performance for a specific gross weight; how much gross weight may be carried with a given engine and still attain this desired performance; how steep a grade and at what speed a specific vehicle may climb; what road speed is best for a specific engine and known gross weight; how fast the vehicle may go, based on tire size, engine speed and total gear ratio; what axle ratio is required to attain this maximum speed and what the engine speed (rpm) is for a known road speed with various tire sizes and total gear ratio. For instance, if you know engine hp, gross vehicle weight and road grade, one of the dual slides on the White truck performance rule will show the maximum driving speed. The rule's upper slide, which calculates answers for Numbers 1 through 4, is based on 87 per cent chassis efficiency. The truck performance slide rule, is available at a nominal price from White Motor Co.

New Cat Dealer

The "big top" was up and the streamers were flying as the Ingersoll Corp. rolled out the welcome mat during a recent open house at their home office in Shreveport, La. Hundreds of guests from a four-state area were on hand for the affair which marked appointment of Ingersoll as the new Caterpillar engine Dealer for Arkansas and Northern Louisiana. Focal point of the event was a large display tent which had been erected on the grounds to house a variety of exhibits showing the line of Caterpillar diesel and natural gas engines in both turbocharged and naturally aspirated versions. James H. Hoag, President of Ingersoll Corp., announced that in assuming the Cat engine franchise, his parts and service facilities will be expanded to assure continued customer service.

READY NOW! The completely new 1960 edition of the **DIESEL AND GAS ENGINE CATALOG,** Volume 25, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 442 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover. Send your order in now for this limited edition, which costs just $10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG,** 9110 Sunset Blvd., Los Angeles 46, Calif.

How VAPOR PHASE® COOLS with WASTE HEAT at ATLAS and TITAN Missile Bases

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At our Atlas and Titan missile bases, for instance, Vapor Phase captures the waste heat from the exhaust and jacket water power-generating Diesels and uses it in a unique — and money-saving-way.

Vapor-Phase® Steam Separator

This heat is "processed" in Vapor Phase Steam Separators and Exhaust Heat Boilers, and incorporated into the absorption refrigeration system which cools the underground computers, radar equipment and other apparatus. Equally interesting are Vapor Phase installations at radar bases which recover engine heat to warm living quarters for the entire staff.

Vapor-Phase® Exhaust Heat Boilers

These are two of many, many uses for Vapor Phase cooling and heat recovery. Perhaps you are overlooking an opportunity in your own operation to turn a liability into an asset with Vapor Phase. Write today for more complete information about this remarkable system.

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"Engine Quality" Handbook

A 28-page handbook titled "Judging Engine Quality," outlines features of various diesel engine designs. It discusses the importance of, and the factors involved with excellence of design, material and workmanship; reliability, cost of operation, parts and service availability, and trade-in or resale value. Cutaway illustrations compare four and two cycle operation; multiple and single orifice injection valves; precombustion chamber and direct injection of fuels; and many other important items involved with selection of engine power. Copies of the handbook, Form 20185-DN935, are available from Caterpillar Engine Division, Peoria, Illinois.

ITS NEW

Three of the five multi-fuel engines at a midwest sewage plant cooled by Young Intercoolers.
Young-engineered Intercooler, one of three furnished as cooling components for turbocharged engines.
Young INTERCOOLERS
boost engine efficiency

HIGHLY EFFICIENT
SUPERCHARGER AIR INTERCOOLERS BY YOUNG

For High Pressure Systems

For Low Pressure Systems

2-Cycle Scavenging Air Coolers

Burning sludge gas in the multi-fuel engines of this modern sewage treatment plant, saves about $50,000 yearly. Further savings are made by using turbocharged engines using Young efficient intercoolers. Actual horsepower of 4 cycle Diesel, natural gas and dual fuel engines has been increased by approximately 50% over a normally aspirated engine through the use of supercharger blowers. Tests and field installations show that intercooling of supercharged air before admission to the cylinders increases the horsepower of the engine from 10% to 33% over supercharged, non-intercooled engines. Over three decades of Young engineered engine cooling experience is at your service to help you solve your cooling problems.

COMPLETE SELECTION OF SURFACES ASSURES HIGHEST EFFICIENCY OF YOUNG-ENGINEERED INTERCOOLERS

Young intercooler cores are available in several varieties of plate fin core specifications for high or low pressures. Plate fins are made of copper, aluminum, or Admiralty metal to meet service requirements. For marine applications Young Supercharger Intercoolers may have cast or fabricated housing, cast bronze header tanks, salt water resistant tubes and tube header sheets. Where further resistance to salt water action is required, they are equipped with zinc pencil inserts.

Select Young for Cooling:

- STATIONARY ENGINES
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- MARINE ENGINES
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- NATURAL GAS COMPRESSORS

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Young *the answer to all your Heat Transfer Problems . . .*

YOUNG RADIATOR COMPANY
General Offices: Racine, Wisconsin
Plants at: Racine, Wisconsin and Mattoon, Illinois

Michigan-Ohio News

By Jim Brown

THE R. G. Moeller Co. of Detroit recently delivered a 65-ton Lorain Moto Crane to L. W. Connelly of Detroit. The crane is powered by a Cummins NTO-6-BI diesel engine—the transportation is supplied by a Cummins NH-220-I-TC with torque converter. The 65-ton Lorain crane is reported to be the largest Moto Crane ever sold in the state of Michigan, and will be used in L. W. Connelly's rental fleet.

JOHN F. Ivory Co. of Detroit has accepted delivery on an International TD-6 Drott 4-in-1 for use on the Ivory farm. Sale was made by Wolverine Tractor & Equipment Co. of Detroit and Grand Rapids.

ROBERT Ernsthausen of Delta, Ohio has installed a new Cummins model C-200-B turbocharged diesel engine (200 hp at 2500 rpm) in his International R-200 tractor. The new engine has a 464 cu. in. displacement and was purchased from Cummins Diesel Michigan Inc. of Dearborn.

A model C-350 Shield-Bantam ½-yd. backhoe with a GM 3-53 diesel engine was recently sold to Art's Excavating Co. of Detroit. Sale was made by Earle Equipment Co. of Detroit.

A Jaeger 600 cfm compressor powered by a GM 6-71 diesel engine and used to supply air to an Airplaco pneumatic machine (for placing concrete in the construction of swimming pools) was recently purchased by General Gunite Corp. of Detroit. The Jaeger compressor runs at 1700 rpm at 100 lbs. pressure, and was sold by Cyril J. Burke Inc. of Detroit.

GREAT Lakes Engineering Co. of River Rouge, Mich. has purchased three diesel engines from Peninsular Diesel Inc. of Detroit. The engines are for use in "Hull 303" now under construction. A Twin GM 12205 will be used as an auxiliary generator (200 KW), a GM 2150 will be used as a standby generator (30 KW) and a GM 5024-7101 engine will be used for fire pump.

MILLER Equipment Co. of Livonia, Michigan has recently sold five Huber-Warco model 10-D graders with GM 4-71 diesel engines. The new graders were delivered to: Louis Garavaglia Co. of Detroit; Petoskey Asphalt Paving Co., Petoskey, Mich.; Gladwin County Road Commission; Shiawassee County Road Commission and the City of Pontiac.

A Galion T-500 grader powered by a Cummins JN-6-BI engine was recently sold to the Allegan County Road Commission. Sale was made by the Grand Rapids Branch of Wolverine Tractor & Equipment Co.

EARLE Equipment Co., Detroit, has delivered an Allis Chalmers model TL-20D Tractoloader to Great Lakes Steel Corp. of Ecorse, Michigan. The Tractoloader is a 3 cu. yd. loader equipped with a general purpose bucket.

JAMES House & Sons of Essexville, Michigan has accepted delivery on two Cummins model C-160-B naturally aspirated engines. The engines will be used in Diamond T model 662 trucks and were purchased from Cummins Diesel Michigan Inc. of Dearborn.

WALTER McManaway of Livonia, Mich. has accepted delivery on an Oliver 88 Hydrotrencher ½-yd. backhoe. The Hydrotrencher is powered by a model 880 Hercules 6-cylinder 70 hp diesel engine and was purchased from Cyril J. Burke Inc.

A model 204 Trojan Loader (2-yd.) recently was delivered to Gilliland Construction Co. of Alpena, Michigan. The new Trojan is powered by a GM 3-71 diesel engine and will be used on various jobs in northern Michigan. Sale was made by the R. G. Moeller Co. of Detroit.

TELFORD Equipment Co. of Detroit reports the sale of a crawler-mounted model M-2460 Warner-Swazey Gradall. The unit was purchased by Michigan Limestone & Chemical Div. of U.S. Steel Corp. at Cedarville, Mich. The Gradall is powered by a Cummins J6-IP, has a 25'6" reach and ½-yd. bucket. It will be used by Michigan Limestone for secondary stripping work.

PENINSULAR Diesel Inc. of Detroit has converted a Ford C-1000 from gasoline to diesel, using a GM 7067-7240 diesel engine. The installation was done for Potter Moving & Storage Co., Royal Oak, Michigan.

MILLER Equipment Co. of Livonia, Mich. reports the sale of a model 180 Michigan tractor-dozer to J. Fons Co. of Troy, Michigan. The new Michigan is powered by a JT6-BI Cummins diesel, is equipped with Goodyear wire mesh 23.5 X 25 tires, and will be used for sanitary land fill.

LUIGI Panetta of Warren, Michigan has accepted delivery on an International model TD-9 bulldozer. Sale was made by Wolverine Tractor & Equipment Co.

STEVE Novak of Battle Creek, Michigan has accepted delivery on an Allis-

Chalmers model HD6E equipped with a model 6HS hydraulic bulldozer blade. Sale was made by Earle Equipment Co.

CUMMINS Diesel Michigan Inc. recently installed two Cummins JT-175-B engines in International model ACO-195 Sightliners for Yellow Transit Co. of Detroit. The installations included two R-46 (8-speed) Road Ranger transmissions and Lite clutches.

A 2¼-yd. Pettibone model 240 AD loader and powered by a GM3-71 engine was recently sold to Salem Gravel Co. of Oakland County, Michigan. Sale was made by Cyril J. Burke Inc.

A model H-120 Hough Payloader powered by a Cummins NRT-6BI diesel was recently sold to L. W. Edison Construction Co. of Grand Rapids, Michigan. Sale was made by Wolverine Tractor & Equipment Co. The H-120 is currently loading out an average of 3,350 cu. yds. of sand a day for an expressway fill.

Lubricators Catalog

A new catalog illustrating and describing its line of force feed lubricators has been produced by Manzel, a unit of Houdaille Industries, Inc. In it is basic information on the principles of force feed lubrication including valuable engineering data on the viscosities of various lubricants. In addition to the specific, detailed operating instructions for each type of lubricator, the 44 page Manzel catalog illustrates many ways in which they can be adapted to specific equipment. A chart offers a quick comparison of all the lubricators with reference to pumping unit characteristics, priming methods, drive types and locations, and lubricants available. Copies of the catalog may be obtained by writing Robert W. Meyers, Sales Manager, Manzel, 315 Babcock St., Buffalo 10, N.Y.

ITS NEW

Solar Sales Representative

Jack L. Duke has been named sales representative for Solar Aircraft Company's gas turbine engines and turbomachinery products in Houston, Texas, and the gulf coast area. Duke's offices will be located in Houston. Before joining Solar, he was district manager for Lynn McGuffy, Inc., Houston.

READY NOW! The completely new 1960 edition of the **DIESEL AND GAS ENGINE CATALOG,** Volume 25, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 442 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover. Send your order in now for this limited edition, which costs just $10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG,** 9110 Sunset Blvd., Los Angeles 46, Calif.

109 Engine Order To White Diesel

An order for 109 engines placed recently with the White Diesel Engine Division of The White Motor Co., by the Corps of Engineers, Kansas City, Mo., represents the largest single engine order ever placed with the diesel division, according to White officials. Valued at $4,500,000, the order also carries an option for 72 more engines at a future date. These engines will drive 500 kw generators and furnish prime power at Atlas missile launching sites throughout the United States. Data on the launching sites is sketchy, but the power units will probably be housed in an underground structure suspended on hard base earth. The building may be 14 stories deep. Engines will be ventilated by huge air intake and exhaust systems. The engines purchased are White Superior 40-SX-8's with 9⅛ in. bore and 10½ in stroke, developing 715 bhp at 720 rpm. Building of the engines will extend through 1960 and most of 1961. Equipment listing for the engines includes General Electric generators and exciters, Elliott turbochargers, Woodward load-sensing governors, and exhaust heat recovery silencers by Engineering Controls, Inc. Additional equipment involves Yates-American lube oil coolers and jacket water heat exchangers, Young intercoolers, Air Maze air filters, Commercial Fulflo lube oil filters, and vibration mounts by Vibration Mountings, Inc.

2,000 Hr. Turbine Run

A successful 2,000 hour run of an AiResearch GTU multi-purpose small gas turbine engine has just been completed. Recent design and material advances incorporated in the unit were proved in the test. As a result, overhaul life has been extended from 200 to 1,000 hours. The unit tested is an AiResearch universal gas turbine (GTU85-5) built as auxiliary power equipment for use aboard giant Douglas C-133 turboprop transports. Not removed from its stand, simulating its aircraft mounting, the unit accumulated a total of 2,700 starts with only routine maintenance necessary during the entire five-month test. In the C-133, two AiResearch GTUs are carried in the left wheel well.

Briggs Representative

The Briggs Filtration Co. has announced appointment of Walter E. Yedlinsky as representative for industrial sales in the western Pennsylvania area. Before joining the Briggs sales staff, Yedlinsky was a senior engineer concerned with the design of nuclear power plants for the U. S. Navy at Westinghouse Electric, Atomic Power Division.

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KATO Brushless
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SAFE . . . DEPENDABLE GENERATOR OPERATION WITH GREATLY REDUCED MAINTENANCE!
Take your choice throughout the KATO LINE, Brushless or Standard slip ring types. For all your 400 cycle or power converting needs investigate KATO's complete line of high frequency alternators and motor generator sets. Packaged Control Systems for all KATO products include KATO magnetic amplifier, voltage regulators, static exciters and motor starters for synchronous or induction motors.
KATO'S COMPLETE LINE OF 50, 60 and 400 CYCLE REVOLVING FIELD AC GENERATORS IS NOW AVAILABLE IN BRUSHLESS DESIGN!
Especially desirable for operation in gaseous environments.
BUILDERS OF FINE, ROTATING ELECTRICAL MACHINERY SINCE 1928!

60 CYCLE SIZES
3 PHASE! 5 to 400 KW
1 PHASE! 5 to 150 KW
SPEEDS 720, 900, 1200 and 1800 RPM.
ADAPTABLE TO ANY INDUSTRIAL ENGINE!
WRITE FOR CATALOG
KATO ENGINEERING COMPANY
1443 FIRST AVENUE, MANKATO, MINNESOTA—Phone 8-2941

9 Pipeline Compressors

Clark Bros. Co. has announced the sale of nine of its model TLA turbocharged, gas-engine-driven compressors totalling 16,200 bhp to Midwestern Gas Transmission Co., a subsidiary of Tennessee Gas Transmission Co. Three units each will be installed in the Northern Minnesota and Staples Minnesota Stations of a proposed new 24 in. natural gas pipeline running from the Canadian border southeast across Minnesota and down into central Wisconsin. The new line will join with Trans-Canada Pipelines Inc., at the northern end and with a Michigan-Wisconsin line in the south. Completion is scheduled for next fall.

LEARN LATEST

VIKING SALES PERSONNEL ATTEND FACTORY SALES AND ENGINEERING SEMINARS.
You can buy a **VIKING** Pump with confidence because the man selling it really knows how to apply the best pump to your particular pumping problem. Yes, your **VIKING** sales technician is well-trained and experienced, and a student of new pumping applications. He attends factory sales and engineering seminars, like the one shown above, to review facts and secure new data on standard and special pumps. He keeps up to date on the latest models and improvements.
Yes, you can place your confidence in the **VIKING** salesman and the **VIKING PUMP**—engineered for your pumping problems. For information, send today for catalog 60 SD. **VIKING PUMP COMPANY,** Cedar Falls, Iowa, U.S.A. In Canada, it's **"ROTO-KING" PUMPS.**
See Our Catalog In Sweet's Industrial Construction and Plant Engineers File.

Inland River Reports

By **A. D. Burroughs**

THE *G. W. Spore,* operated by Industrial Marine Service, Memphis, is being re-powered with two Caterpillar D-353 engines. The Series C turbocharged engines were sold by Taylor Machinery Co., Memphis, Tenn.

DUBUQUE Boat and Boiler Co., Iowa, is completing the river excursion craft, *Julie,* for river excursions. While a paddle wheel gives authenticity, the 65x25 ft. craft is equipped with twin GM 6-71 engines for power.

THE new 75-ft. *John Henry,* a recent production from the Greenville (Miss.) Barge Construction yards, is in action with power supplied by two 500 hp Caterpillar D397 engines. Two D315 Caterpillar generator sets provide full electric power.

THE new *M/V Elizabeth* has joined the Jack Neilson fleet, New Orleans. Completed by American Marine Corp., and delivered to George Engine Co., Harvey, La., the craft has two GM 12V-71 engines for the rated 1,000 hp.

CATERPILLAR engines will equip both of the two vessels under current construction at Greenville Barge Construction Co. One vessel will have 1200 hp, the second vessel will have two D353 engines for a rated 590 hp.

THE new *James R. Hines* receives its share of applause with excellent performance from the twin GM 12-567 engines giving the rated 1800 hp. The 110x28 ft. towboat was delivered to Hines, Inc., Delaware, by St. Louis Shipbuilding and Steel Co.

IN service on the Atlantic Intracoastal Waterway is the new tug, *Nomad.* Built by Diesel Shipbuilding Co., Fla., the craft is powered with two GM (Detroit) Model 6-110 engines for a total rating of 550 hp. Kohler auxiliary power is used.

SPECIALLY designed for shallow water service is the new pusher nearing completion at Diesel Shipbuilding Co. for E. I. du Pont deNemours and Co. The 28x9 ft. craft will gain power from a GM (Detroit) 4-53 engine.

THE F. B. Walker Shipyard, Pascagoula, Miss., is active, constructing a 55-ft. tug slated for twin GM 6-110 engines.

A stock craft, an all-aluminum yacht, is getting the finishing touches at Bender Ship Repair, Inc., Mobile. The double-cabin, flying-bridge craft will be equipped with two GM (Detroit) engines.

ALCO Products, Inc. re-enters the inland river trade with the installation of power equipment on the two new 6500 hp towboats under construction at Jeffersonville (Ind.) Boat and Machine Co. The towboats will serve American Commercial Barge Lines with power delivered from Alco V12-251B engines.

ALBERT F. Holden, new 138x34 ft. towboat of the Island Creek Fuel and Transportation Co., is in action on the upper Ohio River. A Dravo-3200 craft, power comes from two GM engines, model 16-567.

CHRISTY Corp., Sturgeon Bay, Wis., has installed a 3200 hp Nordberg engine, repowering the ore carrier *J. R. Sensibar,* owned by Oglebay Norton Co.

JAYNE Hougland, newest fleet addition to the Hougland Barge Lines, Paducah, Ky., is in service on the Cumberland River. The 150x35 ft. beauty, delivered by Nashville Bridge Co., has a rated 3200 hp supplied by twin GM (Cleveland) engines, Model 16-567.

CINDY Lou, new towboat completed by Humboldt Boat Service, St. Louis, is in action on the Allegheny River for owners Tionesta (Pa.) Sand and Gravel Co. The 32x10 ft. craft has a rated 100 hp from a GM engine supplied by Western Machinery and Engine Co.

READY NOW! The completely new 1960 edition of the **DIESEL AND GAS ENGINE CATALOG,** Volume 25, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 442 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover. Send your order in now for this limited edition, which costs just $10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG,** 9110 Sunset Blvd., Los Angeles 46, Calif.

Oscillograph Booklet

The Heiland Division of Minneapolis-Honeywell Regulator Company has published a new 36-page manual that illustrates various uses of its direct-recording Visicorder oscillograph. Designed as a reference guide for engineers and scientists, the booklet contains 18 case history descriptions of how Visicorders have been used in widely different ways. Included are detailed reports on Visicorder applications in providing high-frequency analog data in industry (from timing telephone switching sequences to checking the phase shift heat on resistance welders); advanced heart and lung studies; missile component testing; drone surveillance; diesel engine testing; oil film thickness measuring on 67,500-kilowatt generators, and nuclear instrumentation. Copies of the booklet are available from the Heiland Division, Minneapolis-Honeywell, 5200 E. Evans Ave., Denver. ITS NEW

New Check Valve

A new Circle Seal engineering development is said to assure O-ring reliability against high pressure split-second surge flows. Faster-acting solenoid and other rapidly actuated valves in higher pressure systems have created new problems which the Circle Seal 200 Series Check Valve was developed to eliminate. O-ring retention is assured by cage device which positively restrains the O-ring from washout, a problem common in other soft-seated valves. Heavier, more rugged construction of the body provides additional protection against abuse and failure. Dead tight sealing and chatter-free operation derive from the Circle Seal design. The valve provides proper cushioning combined with low pressure drop and dependable, sensitive, leak-free reseating. These features make the 200 Series valve suitable for use in a wide variety of high pressure gas or liquid services where extreme surge flows are encountered. Bodies of brass, aluminum, steel and stainless steel are available and range in size from ¼ to 2 inch pipe size. For more information write Circle Seal Products, 2181 E. Foothill Blvd., Pasadena, Calif. ITS NEW

V-Belt, Hose Catalog

A catalog covering its line of industrial V-Belts, including Cog-Belt and Poly-V types, as well as sheaves and industrial hose, has been issued by Dayton Industrial Products Co. The 52-page catalog lists the complete Dayton Product line with data on sizes, dimensions and prices. The new Dayton Catalog #260, punched for notebook insertion, is available without cost from Dayton Industrial Products Co., 2001 Janice Ave., Melrose Park, Ill.

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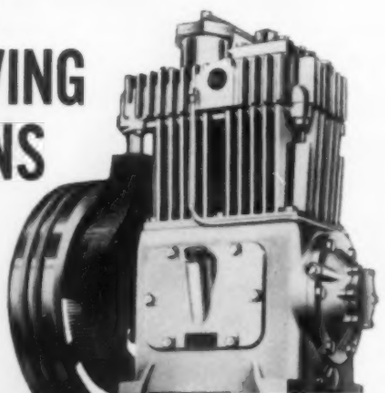

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Service is available across the country—around the clock.

Models from 1 to 90 CFM. *Write for catalog.*

QUINCY COMPRESSOR CO., Dept. DP760, Quincy, Ill.

Makers of the World's Finest Air Compressors

REA's Anniversary Observed

More than 1,000 REA borrower representatives, government officials, past and present REA employees, and suppliers of electrical equipment gathered in Washington on May 11 to observe the 25th anniversary of REA's creation. President Eisenhower sent a message of congratulations "to all who have taken part in the program of the Rural Electrification Administration over the past twenty-five years." The President wrote: "In particular, I wish to salute the citizens who have assisted in the founding and operation of the fine local rural service organizations financed by the REA across the land." Speaker of the House Sam Rayburn, of Texas, addressed an overflow crowd at the Department of Commerce Auditorium, where the official observance took place. Co-author of the Rural Electrification Act of 1936, Speaker Rayburn called the REA program "one of the biggest lifts that farmers ever got." He recalled that farmers had gone through years of distress in the late twenties and early thirties and that the economy was at its lowest ebb shortly before REA was created. The Speaker observed that farmers on rural lines have bought more than $25 billion in manufactured electrical products since REA started. The other guest speaker, Senator George D. Aiken of Vermont, called the executive order setting up REA "one of the most momentous documents ever signed by a president of the United States. It predestined a new era of development for our country. The infant prodigy was a little wobbly on its feet at first," he said. "The $75,000 which President Roosevelt appropriated to start the program would hardly buy a nursing bottle for the lusty $3.5 billion baby which Dave Hamil is guardian for today," Sen. Aiken said. REA Administrator David A. Hamil said that co-op pioneers, the local people who organized the cooperatives, "deserve the greatest share of the credit for the success of rural electrification. It may be too early to assign a place in history to the rural electrification program," Hamil said, "but I believe that it will be recorded as an undertaking as significant to the development of America and the transcontinental railroads or our road and highway network."

Cummins Ltd. Manager

Rex A. Sebastian has been named general manager of Cummins Engine Company, Ltd., manufacturing plant in Shotts, Lanarkshire, Scotland. Mr. Sebastian has been director-purchasing at the factory at Columbus, Ind., USA. The Shotts plant, founded early in 1957, manufactures diesels for automotive, petroleum, marine, construction and mining power. Sales from Shotts primarily are to the British Isles and Canada. Mr. Sebastian joined Cummins at the Columbus factory in 1955 as a sales engineer. Later he was promoted to Assistant Sales Manager, and in 1958 he was advanced to Manager-Special Accounts. For the past year he has been in charge of the Company's traffic and purchasing.

NAME Plans Drive

A fund-raising drive for the benefit of the technical and research committees of The Society of Naval Architects and Marine Engineers has been started. The president of the society, Rear Admiral A. G. Mumma, USN (Ret.), vice president—Engineering, Worthington Corporation, has announced the appointment of a committee to handle the campaign. Chairman of the Committee will be Rear Admiral Robert C. Lee, USNR., Chairman of the Board, Moore-McCormack Lines. This is only the second time in the 67 year history of the Society that it has been necessary to seek funds to support a continuing program of technical research. More extensive research now and in the future is considered to be of vital importance in promoting the welfare of the maritime industry through improvements in the quality, safety and efficiency in the building and operating of ships and inland waterways vessels. The committee will be assisted by the officers and members of the twelve sections of the society located in widely scattered areas of the United States, Canada and the Hawaiian Islands. Early in the postwar period, the technical research activities of the Society were expanded until at present more than 200 members are serving on a large variety of committees and projects. While these members serve on a voluntary basis without cost to the Society, some of the resulting developments require the employment of specialized help to carry the project to fruition. During the past five years the four basic research committees and the controlling Steering Committee have expended a total of $526,312.

Engineering Progress Bulletin

Progress and achievements of the past year, related to the engineering art, are reviewed by Allis-Chalmers in the new edition of *Engineering In Action*, recently released by the firm's Industries Divisions. The colorfully illustrated, 36-page magazine records activities for one of the company's most impressive years of expansion and engineering advance. Eleven chapters describe advance in equipment research and engineering for the generation, transmission and distribution of power, as well as an extensive variety of equipment which utilizes that power. Engineering in Action annual is available as bulletin 25R9529. From Allis-Chalmers Co., Milwaukee 1, Wis.

Detroit Diesel Seminar

Owners and service managers from 15 Detroit Diesel Distributorships and Dealerships in the Southwest, recently attended a service seminar held in Dallas, Texas. Under the direction of Chester B. Clum, Detroit Diesel General Service Manager, the seminar was designed to facilitate the exchange of information and ideas between distributors, dealers, and Detroit Diesel's service staff. New products, new product developments, distributor-dealer-plant relations, and service procedures and methods were discussed.

Transportation Study

White Motor Co. has launched a new research study of all forms of transportation to guide its long-range product development program, it has been announced by J. N. Bauman, president of the Cleveland truck-manufacturing firm. Mr. Bauman said that William F. LeFevre, outstanding automotive and aircraft research engineer, has been appointed director of advanced product research to head this expanded White Motor research program. "Today's society is so increasingly dynamic in its population outspreading and its constant new demands on our transportation system," Bauman said, "that we feel a comprehensive, continuing new study of all transport forms is essential to maintenance of a sound product development program for the long-range future." LeFevre takes over his new White Motor position after serving Freightliner Corp. as chief engineer and chief engineer-research from 1950 to June, 1959, and Fruehauf Trailer Co. as manager of research from June, 1959, until joining White. LeFevre performed research for the Missouri Highway Department during his college graduate work, followed by several years in research work at Boeing Airplane Co. in the structural development group and in gas turbine and missile projects.

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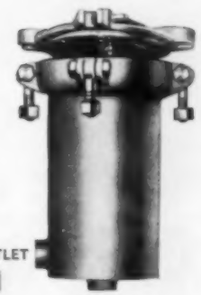

Nugent now manufactures a line of basket-type strainers offering the added protection of magnetic separation. Specially designed Alnico magnets establish a magnetic field through which the strained liquid must pass as a final stage before leaving the unit. Thus, minute ferrous particles are trapped and removed from the fluid stream.

If you have valuable engines or other equipment which demands top-notch lubrication protection, it will pay you to get the full story on the Nugent combination strainer-magnetic separator.

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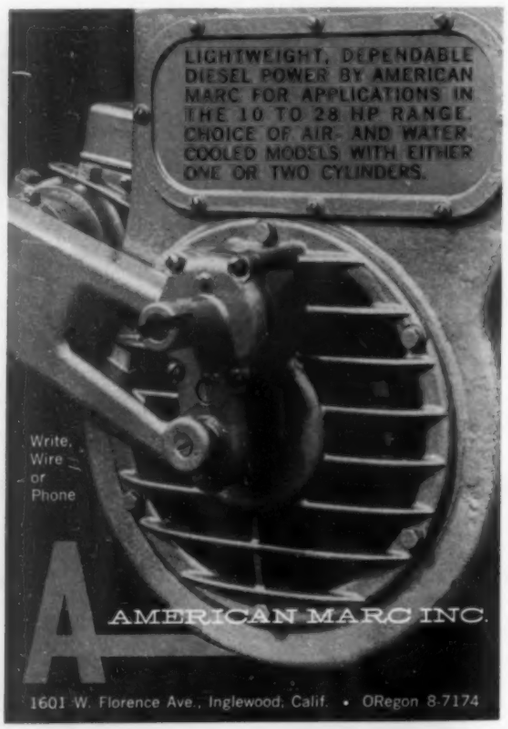
OILING AND FILTERING SYSTEMS • OILING DEVICES
SIGHT FEED VALVES • FLOW INDICATORS

EMD Promotion

Appointment of Roy T. Schmidt as manager, St. Paul parts warehouse, Electro-Motive Division of General Motors, was announced by F. D. Lapham, director of production control and purchasing. Mr. Schmidt started work at Electro-Motive's St. Paul branch in 1946 as a stockkeeper. He was promoted to parts warehouse supervisor in 1956.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Simple . . . Rugged . . . Reliable

50-60 cycle single and 3-phase with many optional features!

Lake Shore provides the output range you need with superior enclosure . . . standard, easily replaced components and coded harness with all leads pigtailed. Compactly designed for easy cable connection.

Manufacturers of Trans-O-Matic Motor Driven Transfer Switches • Solenoid Operated Breakers • Autostatic Voltage Regulators • Adjustable Differential Voltage Relays.

THE Lake Shore ELECTRIC CORPORATION
205 Willis Street Bedford, Ohio

West Coast News

By James Joseph

SOLD to Harbor Boat & Yacht, San Diego, Calif., a GM 3061-A diesel marine engine with Twin Disc torque converter. Sale by San Pedro, Calif.'s Anderson-O'Brien Co.

TO Pacific Cement & Aggregates Co., Davenport, Calif., a Caterpillar D337F (300 hp at 1800 rpm) diesel to repower a Bucyrus Erie 54B shovel.

FOR Children's Hospital of the East Bay, Oakland, Calif., a Caterpillar D337H 200 kw diesel-electric emergency standby power set—for the 142 bed hospital. Sale by Peterson Tractor Co., San Leandro, Calif.

A pilot model mine scoop, designed by a Portland, Ore. firm, is powered by a Deutz F6L 712 air-cooled diesel. Installation reported by Diesel Energy Corp.

Subsidence in California's long-plagued Wilmington oil fields has come to a virtual halt across an 800 acre area, announces Long Beach, Calif.'s Harbor Dept. Halting ground sinkage are a phalanx of gas-fueled pump engines—Waukesha, Superior, Buda—which daily are injecting underground, through 120 scattered wells, some 435,000 barrels of salt water.

DELIVERED: to Lyon Van Lines Inc., Los Angeles, 25 new International Harvester cab-over tractors powered by Cummins NH-220 engines.

INSTALLED: at County Sanitation Districts of Orange County (Calif.), three Climax (Waukesha) V-122 dual-fueled gas engines, rated 300 hp for their high-tide booster chore at outfall ocean pipeline. Two additional V-112s are scheduled for installation.

FOR a 60-ft. yacht being built for Art Kates, Los Angeles, two GM 6-71s (model 6071 and 6072-A).

SOLD to San Diego's Ryan Aeronautical Corporation, a GM 4-53 diesel propulsion unit with 2:1 reduction for a company owned boat.

INSTALLED: in a Cleveland trencher model No. 140, a Cummins C-70 (70 hp at 2000 rpm) diesel replacing a gas engine. Sale by Cummins Service & Sales of Bakersfield, Calif.

CUMMINS Service & Sales, Los Angeles, has repowered a new tilt-cab Ford C-600 tractor with Cummins' new C-160 "stop-go" 160 hp at 2500 rpm diesel engine—the rig and its trailer to tote diesel parts in the Bakersfield, Calif. area. Automatic transmission is by Allison.

SOLD: to Ketchum's Wood Yard, Chatsworth, Calif., a Minneapolis-Moline D-425-6A, 61 hp at 1300 rpm diesel, to power a 30-inch stroke wood splitter. Sale by Industrial Engine Service, Los Angeles.

ELECTRIFYING a Macco Corp. trencher is a Murphy generator set (with Murphy diesel Model 122), which powers a dozen motors, including two 50 hp, in converting this trencher to diesel-electric power.

AT work on Healy-Tibbets Construction Co. barge, in off shore Calif. oil operations, a Lister-Blackstone HA-2, 10 kw generator, powering radios and lights. Supplier Industrial Engine Service, Los Angeles.

TO the Moulton Ranch, El Torro, Calif., an M.A.N. 4L tractor, 28 hp at 1700 rpm, by Fountain Valley Equipment & Tractor Service, Fountain Valley, Calif.

NEWLY installed and working dragline near Salt Lake City, Utah, a Deutz A12L614 engine, rated 200 hp at 1800 rpm.

AN unspecified number of Deutz F1L-712 engines have been air-freighted to ice cap locales along the U.S.'s far-northern Dew Line radar net.

R. A. Briggs & Sons, Roseburg, Oregon, has purchased 18 new International-Harvester RDF-405 tractors, powered by 300 hp Cummins NHRB-6-B diesels with 10-speed mains and 3-speed auxiliary transmissions.

Kroger Adds Diesels

Kroger Co., the nation's third leading retail food chain whose truck fleet is considered one of the most modern systems in the country, is adding 40 new GMC diesel highway tractors to its decentralized operation. The new GMC steel tilt cab units, model DL7000s, will bring the number of GMC diesels operated by Kroger to 309 units. Company officials said 25 of the new vehicles will go into service in Grand Rapids, Mich., while most of the remainder will operate out of Indianapolis, Indiana, and Memphis and Nashville, Tennessee. A recent addition to the GMC line, the DL7000s are 72 in. long from bumper to back of cab and have a set-back front axle for better weight distribution. They are powered by the GMC 6V-71 diesel engine developing 189 hp. Gross combination weight ratings range upward to 76,000 lbs., with the standard rating set at 60,000 lbs.

Filter Media Brochure

Filtration Products, a new 18 page booklet issued by Purolator Products, Inc., lists information on various filter media for process fluids, nuclear applications, internal combustion engines, hydraulic fluids, machine tool coolants, bulk fuel, and many other applications. Information covers explanation of flow rate, degree of filtration, viscosity of fluids, and reliability for such filtration media as Micronic ® "paper", metal edge, wire cloth, porous metal media, plus oil absorption and water separation filters, and specially-designed filtration units for high and low temperatures (from minus 420° F to plus 1200°F), high pressure, and corrosive gases and fluids. For each of the filter media covered in the new booklet, operating specifications are given for range of filtration, temperature limits, flow characteristics, and typical applications and assemblies are used to illustrate ranges. For copies of the new booklet, IND-1-60, write: Department 135, Purolator Products, Inc., Rahway, N.J. ITS NEW

Spray-On Damping Compound

A new, viscoelastic material which, when sprayed or trowelled onto metal plate, reduces structurally borne noise and vibration has been announced by The Korfund Co., Inc. The compound renders metal plate acoustically equivalent to a sheet of cork. Designated Korfund Vibrodamper Compound, this material is said to solve problems of noise transmitted along structural paths thru sheet metal, and of the drumming noise created by vibration or thermal movements of metal plates. Vibrodamper Compound is handled like a coat of paint, dries to a smooth, attractive finish, is non-toxic and non-flamable. (Also available in fire-resistant form). It is resistant to alkali, grease, gasoline, and aliphatic oils, and is unaffected by ozone or sunlight. It has an extremely long effective life, and does not become brittle or change in any way with age. Technical data is available from The Korfund Co., 48-48D 32nd Pl., Long Island City 1, N. Y. ITS NEW

Computers Free Engineers

The day is approaching when engineers will not have to spend time in tedious calculations and will be free to deal more effectively with more important matters, such as fundamental elements of design, improvements in equipment performance and reductions in manufacturing cost. Thus declared C. A. Petersen, assistant engineering manager of Elliot Co., Ridgway, Penn., as he discussed use of a general purpose computer in the company's engineering operations. Twenty-five engineers utilize the computer in electrical and mechanical design calculations, as well as analysis of test data, in the company's product engineering department. Of these, 17 have been taught a simplified coding method which, according to Petersen, makes the computer "so simple to use that our engineers employ it as they would a slide rule." Stress calculations, he noted, which take one day by hand may be done in three minutes by the computer. Stability calculations which take five days by hand are turned out in one hour by the computer, a desk-size G-15 made by the Computer Division, Bendix Aviation Corp. In addition to the time saved, Petersen lists accuracy among the virtues of the computer.

New Valve Line

A new 20000 series of single seated control valves has been announced by Mason-Neilan, Division of Worthington, Corp., engineered expressly to meet requirements of modern power plant applications. Features of this new 20000 series include high capacity, ability to handle high pressures and pressure drops and a wide selection of reduced capacity trim. Mason-Neilan design incorporates a top guided, unrestricted seat-ring area with body and plug contours providing greater capacity than most top-and-bottom-guided double seated valves of comparable sizes. The 20000 series is available in a range of sizes from ¾ in. to 10 in. with ratings in iron of class 125 or 250 ASA, and in steel from 150 to 2500 lb. ASA. Standard spring-diaphragm actuators are sized according to body rating, and for applications beyond the scope of spring diaphragm actuation, springless diaphragm, cylinder or electric drive actuators are available. For complete information, contact Mason-Neilan, 63 Nahatan St., Norwood, Mass. ITS NEW

Allison Promotions

Four executive changes in the Transmissions Operations of the Allison Division of General Motors were announced recently by K. H. Hoffman, Operations Manager. Edgar G. Davis, former manager of the Bearings Department, becomes manufacturing manager, Transmissions Operations. He replaces William E. Goohs who earlier was named assistant manager of manufacturing, Aircraft Engines Operations. Hugh C. Kirtland was named manager of quality control. He formerly was chief engineer, Transmissions Applications. William J. Purchas, Jr., former chief engineer of the Bearings Department, becomes chief engineer—Applications. Paul J. Lindley, former manager of quality control, was named manager of reliability. P. G. Martich, former bearings sales manager, moves to the Transmissions sales department.

Air Compressors Catalog

Published by Clark Bros. Co., new Bulletin 185 presents the Clark line of balanced/opposed air compressors for standard 110 psi industrial applications. Described and fully illustrated are details of the compact, heavy-duty Clark design. Specifications cover the complete line of 23 models (including units for soot blowing). Strokes range from 6 in. to 17 in. and sizes from 75 to 2000 bhp. Copies of Bulletin 185 can be obtained by writing to Clark Bros. Co., Olean, N.Y. ITS NEW

Add Diesel Tractors

Crouch Brothers, Inc., common carrier operating in the Midwest, has taken delivery of 24 heavy-duty International dieselized highway tractors as part of a fleet expansion and modernization program, it was announced by President Ovid Crouch. The new units are model DCOT-405 tractors with V-belt drive pusher axles. They are equipped with 80 in. sleeper cabs, Cummins NH-220 engines, aluminum frames and ten-speed Roadranger transmissions.

Filter Cartridge Package

An improved method of packaging diesel fuel oil filter cartridges has been introduced by Wix Corp., Gastonia, N. C. Each cartridge is now encased in a tough, transparent, polyethylene envelope that resists tearing and damage. It is thermal-sealed to prevent any contamination.

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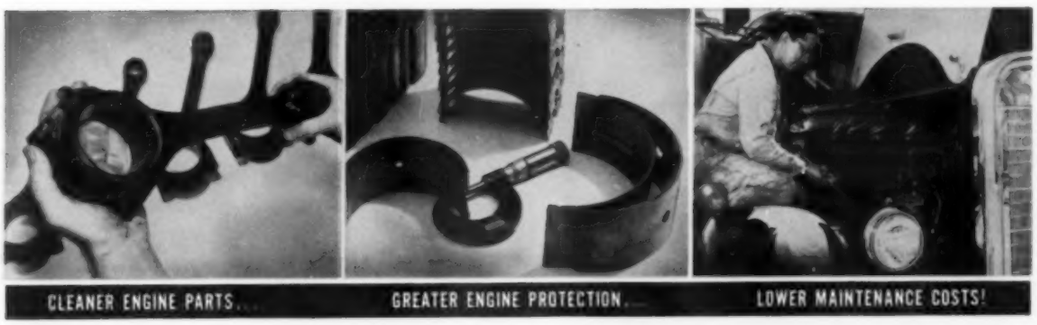

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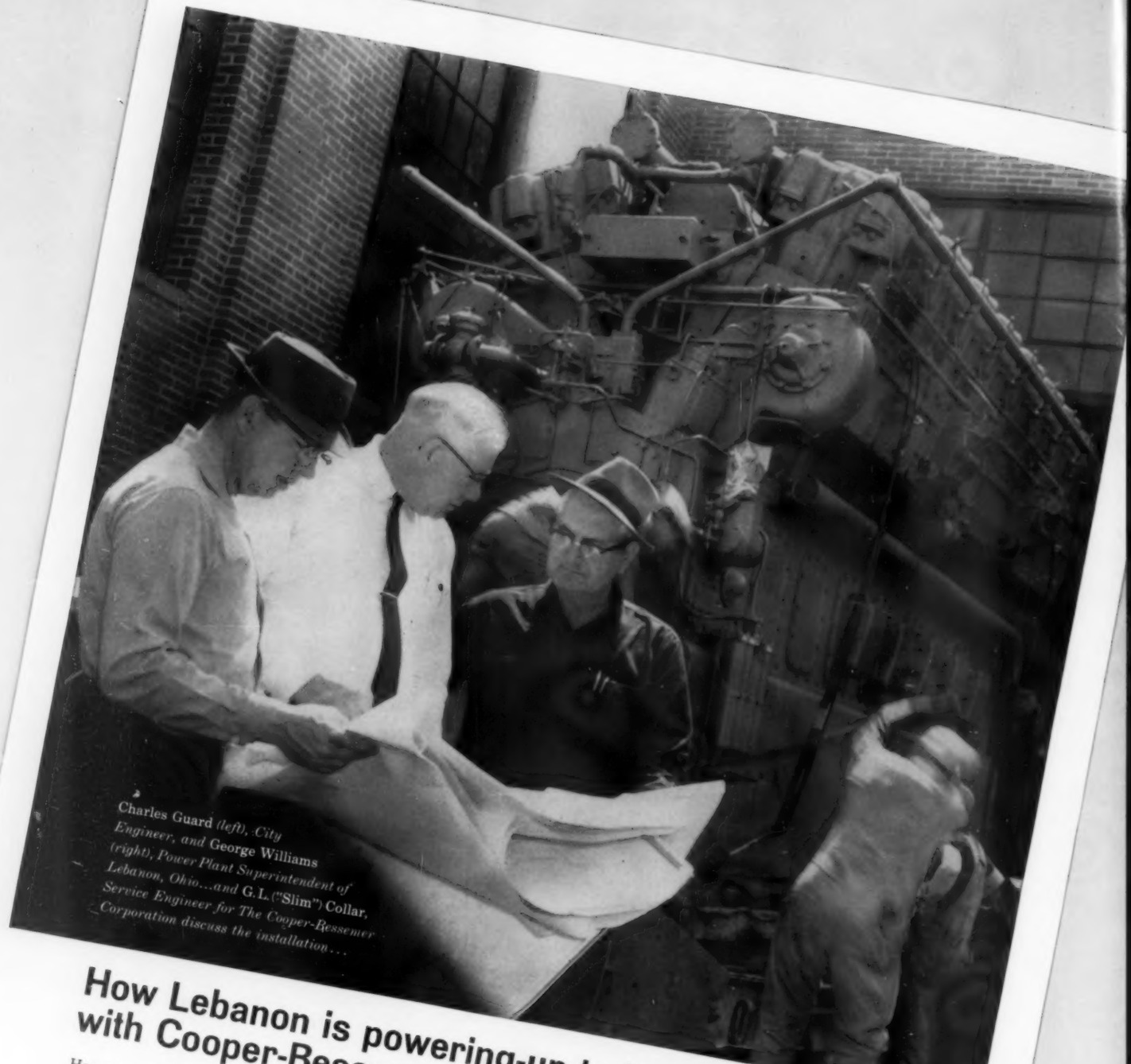

Charles Guard *(left), City Engineer, and* George Williams *(right), Power Plant Superintendent of Lebanon, Ohio....and* G.L.("Slim") Collar, *Service Engineer for The Cooper-Bessemer Corporation discuss the installation...*

How Lebanon is powering-up to keep costs down with Cooper-Bessemer engines

Here you see the new Cooper-Bessemer LSV-16 gas-diesel engine being moved into the power plant of Lebanon, Ohio to double its present capacity. This is the second LSV to be installed here. After three years' experience with a smaller unit, Lebanon Trustees of Public Affairs know how economical this turbocharged Cooper-Bessemer engine really is!

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